THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXIV. No. 1896.] LONDON, SEPTEMBER 12, 1899. [51ST YEAR. PRICE 6d.

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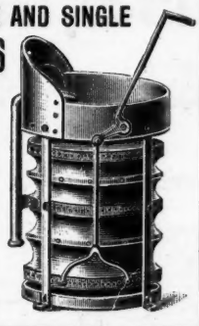

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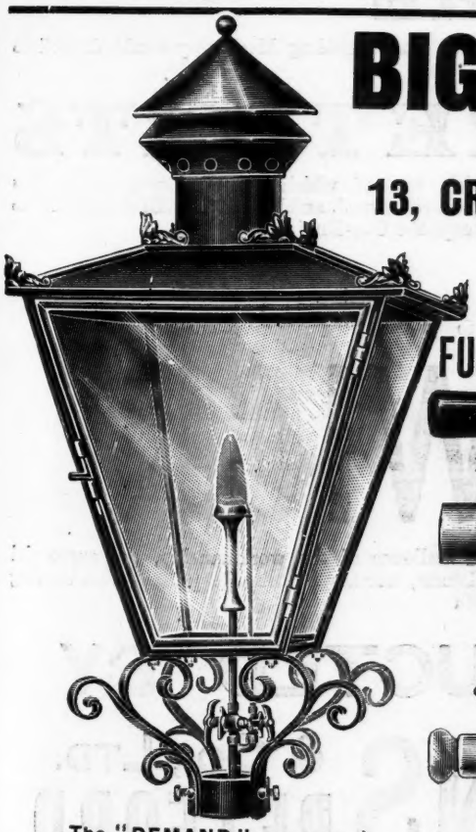

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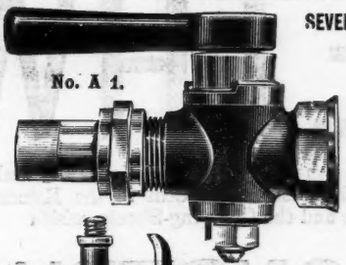

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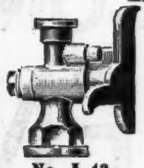

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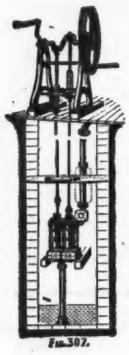

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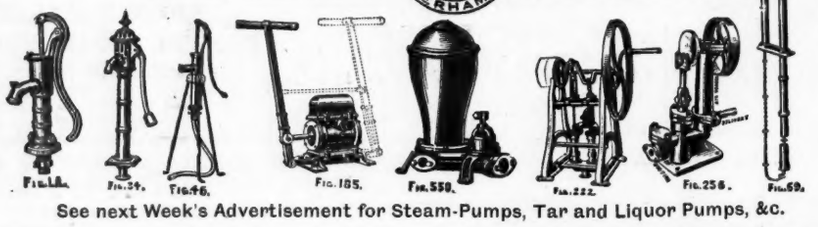

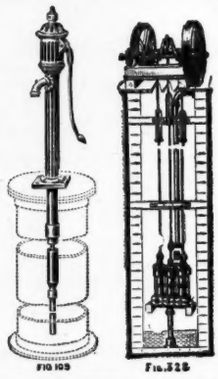

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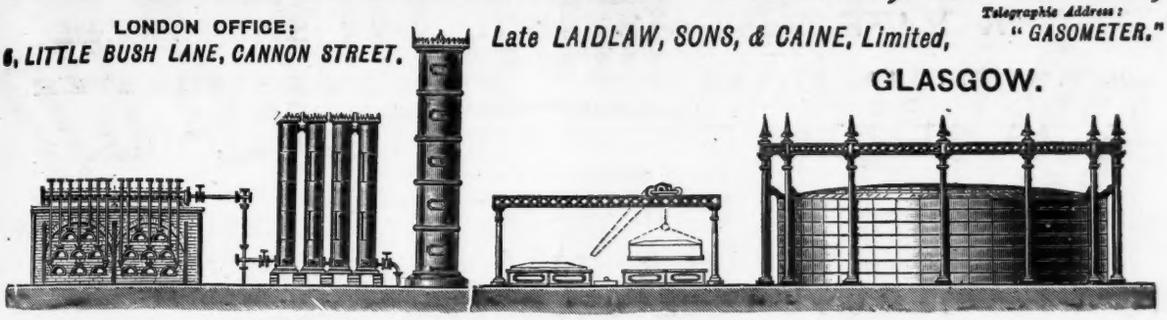

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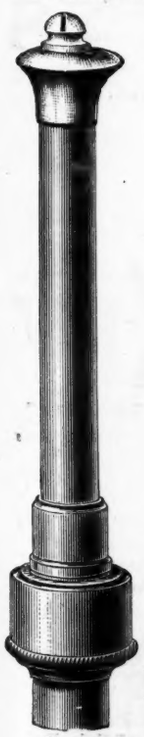

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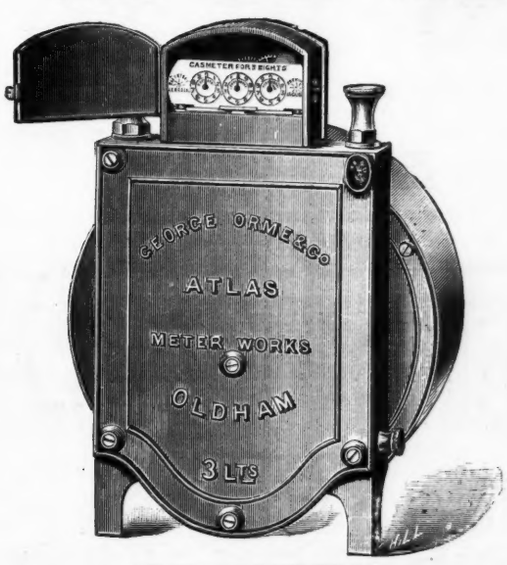

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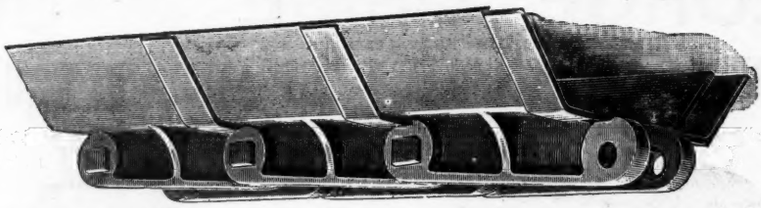

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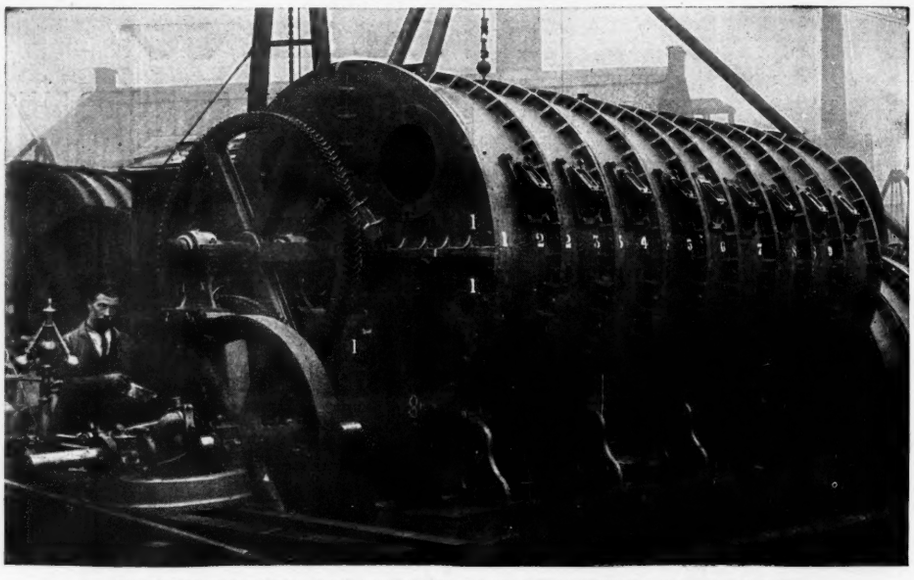

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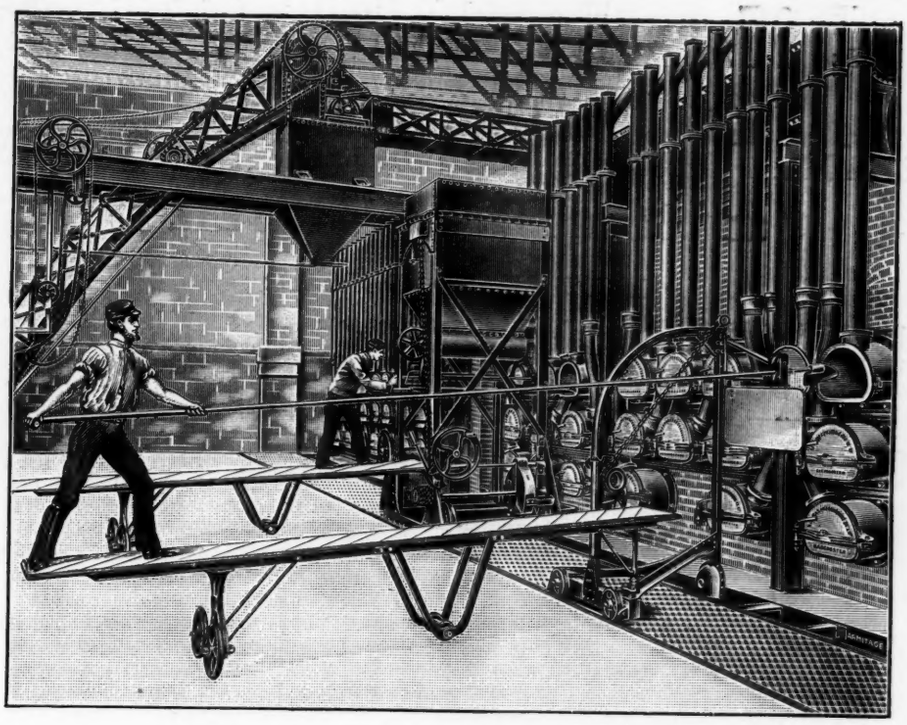

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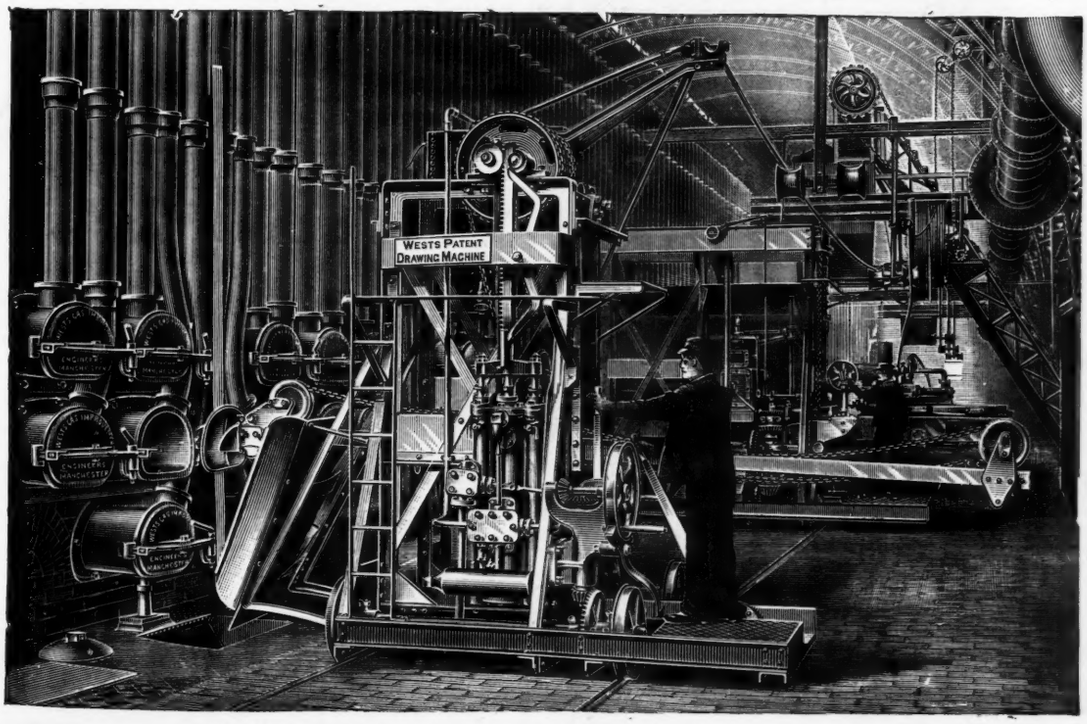

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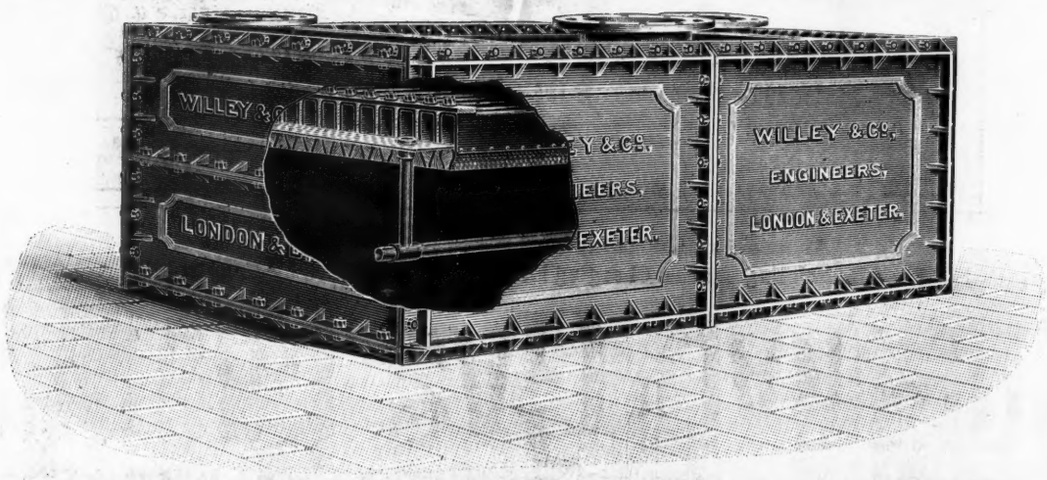

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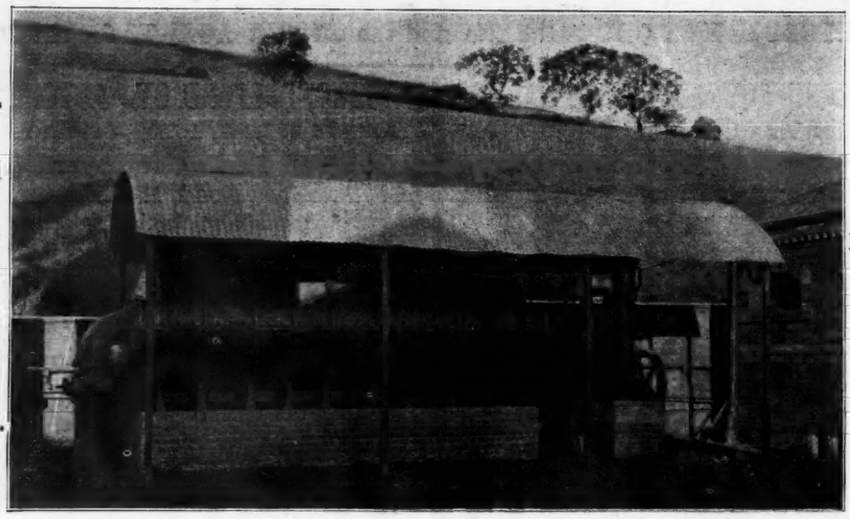

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Liverpool	3,500,000	Lawrence, Mass.	400,000
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Brighton	1,750,000	New York (Remodelled)	11,000,000
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New York	1,200,000	Perth, W.A.	125,000
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Bath	1,000,000	Maidenhead	225,000
Newburgh, N.Y.	350,000	Epsom	225,000
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Hoylake	125,000	Wandsworth and Putney	1,800,000
Coventry	600,000	Aarhus	800,000
Coventry (Second Contract)	600,000	Falmouth	150,000
Bordentown, N.J.	125,000	Southampton	800,000
Winchester	200,000	Hartlepool	750,000
Shanghai	225,000	Utrecht	1,000,000
Stockport	500,000	Deventer	150,000
Norwich	1,000,000	Portsmouth	1,000,000
Holyoke, Mass.	600,000	Bournemouth	1,000,000
Lea Bridge	350,000	Aylesbury	150,000
Lea Bridge (Second Contract)	350,000	Hamburg	1,750,000
Stockton-on-Tees	500,000	Dublin	2,000,000
St. Joseph, Mo.	750,000	Redhill	275,000
Edinburgh	2,000,000	Stockport (Second Contract)	500,000
Guildford	350,000	Brighton (Second Contract)	1,750,000
Brentford	1,200,000	Croydon (Second Contract)	625,000
Bridlington	125,000	Maidenhead (Second Contract)	225,000
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Middlesbrough	1,250,000	The Gaslight and Coke Co., Fulham	1,750,000

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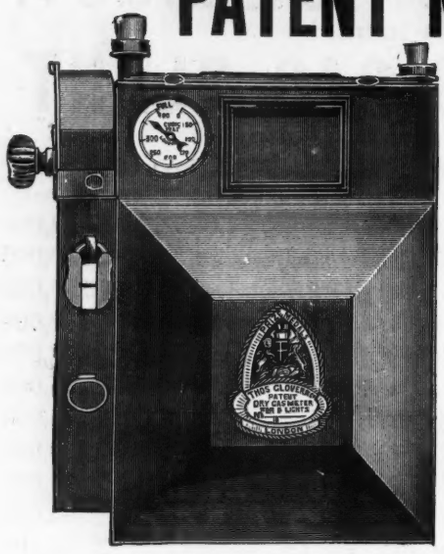

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EDITORIAL NOTES.

The Cause of Labour in a Bad Way.

THE cause of Labour—with the capital L—has been in a bad way during the past week. The big strike of seafaring hands which Mr. J. Havelock Wilson, M.P., so carefully advertised in advance, failed to come off. This affair, indeed, took the course we confidently predicted in our last issue. Mr. Wilson's Trade Union was shown to be merely the shadow of a name, and himself to have no following worthy of a moment's regard. A more impudent attempt to make capital out of the gullibility of the "popular" newspapers in regard to anything bearing a Trade Union label, was never conceived in the counsels of the New Unionism, which is a good deal to say. Some of the newspapers succeeded in getting hold of the General Secretary of the Seamen's and Firemen's Union, and were amazed to learn that no arrangements for strike pay had been, or could be, made. The men were told to strike, and leave the rest to Providence—or Mr. Wilson. It is not surprising that "Mercantile Jack" did not think the prospect sufficiently alluring. He has allowed Mr. Wilson to pose as his earthly Providence before now; and the performance was not a success, although there was some of his money to keep it going. Without a "shot in "the locker," there is not much chance of a better result this time. As we expected, also, wages have risen in some ports as the result of improved trade. Mr. Wilson's desperate move was a forlorn hope for getting some credit for this improved state of things in the Mercantile Marine.

The other disappointment in Labour—which does not mean actual working—circles is the Trade Union Congress. Even the most "popular" newspapers have had to give up trying to make believe that this gathering is worth anything as an index of working men's opinions. The exclusion, or secession, of the Amalgamated Society of Engineers took much of the life out of the congress. The President was a glib young socialistic printer, very much accustomed to public speaking from local platforms. His address was the familiar farrago about the necessity for "eliminating "the employer," and about as unpractical as the worst foes of the working man in politics could desire. As was the presidential address, so were the resolutions and orations which followed it, and constituted the "business" of the congress. Nothing attempted, nothing done, but the winnowing of the same old chaff which is kept from one Trade Union Congress to another. If the typical employer were the slave-driving ogre that the Socialist fancy paints him, he could not have a greater pleasure provided for him, at the workers' expense, than to see his slaves playing with words like this, and flattering themselves they were improving their position thereby. Having had their amusement, the "slaves" go back to work as usual, for with all their aspirations for the elimination of the employer, they must live, and it is the employer who, for his own base and selfish ends, keeps them from starving. How empty and vain it all is!

The congress cannot deal satisfactorily with its own internal affairs. The exclusion of the A.S.E. was bound to come before the meeting, on the report of the Parliamentary Committee. Mr. Curran, of the Gas Workers, had the common sense to raise a protest against the rule under which the Engineers had been shut out from the congress; but, after much talking, the matter was shelved by a vote for proceeding with the next business. The delegates will learn in time that a difficulty shirked is only made more troublesome thereby. After this bit of evasion of a home duty which nobody but themselves can discharge, the delegates proceeded to knock off gaily the usual tale of abstract resolutions for making a new heaven and earth. Mr. W. Thorne, of the Gas Workers, is for making a general eight hours' law a test question at elections—carried, "after some discussion." The delegates amused themselves for some time over the puzzle of bimetallism—of course, without contributing in the smallest degree to its solution. One of the few points of real interest of the whole meeting came out in the remarks of one of the American delegates. It referred to what appears to be another failure of the American written Constitution. Under the American constitutional system, legislation is subject to the control of the Supreme Courts. It is difficult for Englishmen, accustomed, as a matter of course, to the supremacy of Parliament in legislation, to realize a condition of affairs in which the British relationship of Parliament and the

Courts is reversed. Our Judges sit to execute the Acts of Parliament, so far as they can understand them. In the United States, any Act of the Legislature can be impeached before a Supreme State Court as unconstitutional. An appeal lies, moreover, from a Supreme State Court to the Supreme Court of the United States, which is the ultimate authority on the point of constitutionality.

It is easy to see how this system works in favour of litigants with long purses. If the Labour party of a particular State Legislature succeeds in passing (say) an Eight Hours' law, the Act of the Legislature can be appealed against at least twice over. This practically puts all "advanced" Labour legislation at the mercy of the big "Trusts," who can always find the money to grease the ways of the Courts. It is a striking illustration of the evil of unnecessary appeals. Besides, there can be no doubt that the knowledge that their Acts are not final encourages the State Legislatures in indulging in much irresponsible frivolity. The big employers may take care that the Legislatures do not "make hay" of the natural economic laws which govern industries and trades all the world over; but where it is nobody's interest to interfere, the Legislatures play all sorts of fantastic tricks, which only react upon themselves. Another interesting figure at the Trade Union Congress was Mr. Hansen, the Danish representative, who claimed that the great strike of Trade Unionists in Denmark had ended in a complete victory for the strikers. We should certainly like to have the facts of this matter.

Sir Edward Fry on Commercial Morality.

Sir Edward Fry has been in Birmingham, speaking under the auspices of the local Society of Friends, on the delicate subject of commercial morality. The great difficulty in all questions of morality, commercial and otherwise, is to make the abstract principle work in the concrete case. As another philosopher has said, or sung, we are all strong against wrong in the abstract—"for that "kind of wrong is always unpopular, and never gets "pitied; because 'tis what nobody never committed." It is only when the moralist gets to the "particular sins" that he has to mind his ways, because he may "kick the "people's own shins." So in regard to the cardinal points of commercial morality, the trouble is to deal effectively with the dubious trade custom, the thing that everybody does and expects, the grasping at an unfair advantage, the lying advertisement, and all the other "tricks of trade" which everybody knows of—by hearsay. There is the canker of secret commissions, for instance. Well, it is bad, no doubt; but it is the spirit of the thing that requires to be brought out by those who would purify trade, or else we shall see even greater evils succeed to the empty place. Sir Edward Fry rightly laid great stress on the changed modern conditions of trade and industry, which have encouraged new ways of doing business. He mentioned among these the subdivision of labour, the growth of the system of agency, and the entire substitution of competition for custom. According to his view, the modern system offers many more facilities for the use of "palm oil" in securing and easing business. Where a trade was carried on in the old family style, by father and sons, "there would be very little temptation for any-"thing like corruption or bribery." Now, of course, most big concerns are carried on by a complete administrative and executive machinery of directors, managers, superintendents, foremen, and a whole hierarchy of officials.

Yes; but this implied contrast of working conditions shows how a single idea may obscure the perceptions of the wisest of us. Sir Edward Fry conjures up a picture of a Golden Age of trade, which, like the corresponding *régime* of the French romantic philosophers, never had an objective existence. We have only to read the older novelists and historians of manners to perceive that bribery and corruption were much more prevalent in former times than during the present age, bad as it may be. What about the state of things in the national services recorded as a matter of course by the worthy Samuel Pepys? Is it conceivable that such a general system of plundering the State as he witnesses to could have subsisted unless it was fully paralleled in commercial and private life? And as to the superior morality imagined to prevail when traders lived by "custom" instead of competition—has Sir E. Fry forgotten how the custom of the older race of shopkeepers was generally kept up? What of the "vails" and the "perquisites" of old family servants, and the shameless way bad debts were spread over the "books" of good payers?

By a remarkable coincidence, on the very day that a public meeting in Birmingham listened to, and applauded, the virtuous sentiments of Sir Edward Fry, a couple of public meetings of disappointed and, it is hinted, swindled shareholders in local joint-stock companies were held in the City. This is the kind of object-lesson the professional moralist likes; and unhappily there is small prospect of the supply failing, while so much of the business of the country is done on the limited liability system. For as the liability of shareholders is limited under this system, so is their knowledge of what is being done with their money. Limited liability too often means unlimited credulity and grasping after unearned riches. Gambling, unfortunately, is not corruption; but it enters more into some people's notions of business dealings than they would be willing to confess.

Complaints of the Workmen's Compensation Act.

The Workmen's Compensation Act is an unfailing subject of controversy, which the political newspapers sedulously cultivate as a means of setting the "Codlin" of Mr. Asquith against the "Short" of Mr. Chamberlain. Recently "Mabon," M.P., has obliged a South Wales newspaper by giving his views of the Act and its working, in the form of a special article. Naturally, the writer confines his attention to the knotty points of the law, and the hard cases of litigation which have come under his personal notice. This is a very useful kind of criticism, so long as it is kept within its natural bounds, and is not forced into supporting some preconceived purpose. Acts of Parliament can only be drafted in ordinary language; and it is impossible to anticipate the difficulties both of interpretation and application that may arise through the force of circumstances. It is easy to be wise after the event, and people are apt to expect too much of the wisdom of Parliament. Parliament is almost omnipotent in this country, under the higher law of God as progressively ascertained by the human spirit; but it cannot make the English language mean other than it does according to the trained understanding of Her Majesty's Judges. Much of the vague complaining against the operation of the Workmen's Compensation Act proceeds from heedless or wilful misunderstanding of the nature of the statute as a limited and enabling law. It is because it not only says that certain classes of people shall be compensated for injury, but also says who shall pay them, that disputes arise and litigation follows. As we have always argued, the amount of litigation that has cropped up under the Act is not excessive; nor is its origin often unreasonable. It would be much worse for the credit of the Act if there were no litigation, because this would mean that it was a dead letter.

It is a remarkable circumstance that those who, like the Trade Unionists in congress, profess the most utter scorn and hatred of the Act, can express their distaste in no more effective manner than by asking for its extension. Some of the political newspapers fondly hoped that the Plymouth congress, when it came to discuss the Compensation Act, would produce another stick wherewith to beat the Government and Mr. Chamberlain. Great must have been their disgust when the congress only placed upon record a request for the amendment and enlargement of the Act upon lines amply recognized and debated during the passing of the Bill through Parliament. This amendment and extension will come in good time, no doubt; and when it is completed, the industrial world will be the duller for the want of a good subject for grumbling over.

Self-Help versus State-Help.

Two reports, appearing simultaneously in the daily papers of Saturday last, throw into strong contrast the manly spirit of self-reliance and the enervating desire for State aid. The former was one of the most admirable features of the earlier Trade Unionists; and its cultivation in the working classes was the animating spirit of many of their truest friends—such men as Richard Cobden, Charles Kingsley, and John Stuart Mill. The latter is one of the modern and regrettable tendencies of Labour politics—of the New Unionism—the tendency to call upon the State to do for the working man what, if he would possess independence and self-respect, he should do for himself. The reports to which we refer are those of the opening ceremony of the Bishop Auckland Cottage Hospital, and of the resolution passed by the Trades Union Congress on the subject of

old-age pensions. Lord Rosebery, in opening the hospital, remarked that the great salient fact connected with that institution was, to his mind, that it was to be maintained by the miners themselves. He went on to say:

> The miners of this district are determined that their hospital shall be their hospital in truth and in deed; and, although it would have been easy for them to ask the wealthy inhabitants of this district to find the money to support the hospital, they have insisted upon doing it themselves. Now, I welcome that, because of a great general principle. The State in these days is constantly appealed to to do everything for us, from the cradle to the grave. . . . But I am anxious to maintain the self-reliant and independent character of our people. When that fails . . . your Empire, of which you hear and boast so much, will not be worth five minutes' purchase. What is the State? The State is, after all, only the aggregate of the individuals who compose it. . . . If you weaken their character, if you strike at their independence, your State—by whatever name you may call it—will have vanished like an empty dream.

In the very next column we read that the Trades Union Congress resolved that, in their opinion, "no scheme "dealing with old-age pensions will be satisfactory to the "whole of the workers of this country which makes it a "condition of thrift, or disregards the inability of a large "proportion of the industrious and deserving poor to "make provision for the future." The proceedings at Bishop Auckland appear to throw strong doubt upon the right of the congress to speak for "the whole of the "workers of this country;" and we are inclined to think that the resolution would have been nearer expressing the true facts of the case if the word "disinclination" had been substituted for the word "inability," or if the adjective "small" had been used in place of "large." We can only hope that the effort being made by the official Trade Union leaders to regain their fast-slackening hold upon the wiser and more far-seeing section of the working classes, by advocating the policy of substituting State doles for thrift and providence, will be doomed to failure; and that—to quote from a letter of Cobden's written sixty years ago—those classes may "be found to contain a great "proportion of minds sufficiently enlightened by experi-"ence to concur in the opinion that it is to themselves "alone, individually, that they, as well as every other great "section of the community, must trust for working out "their own regeneration and happiness." By such a course, and in that way only, can any man retain his own self-respect, or hope to obtain the regard of his fellows; and the truer "friend of the working man" is he who will urge upon him the need of self-reliance, rather than he who holds out flattering and delusive prospects of free benefits to be derived from Parliament.

A Remarkable Climatic Experience.

THIS wonderful summer has been remarkable in many respects, and several meteorological records must have been established for the instruction of future ages as to the climatic conditions under which the present century began to draw towards its close. Last week a period of stifling heat was accentuated, rather than interrupted, in the heart of London by a sharp, short thunderstorm, which broke over the City at 12.30 on Wednesday. For a few minutes the rainfall appeared to be going to make up some of its arrears; but the downpour ceased as abruptly as it began. We mention the storm here because it supplied a striking illustration of the exigencies of the artificial lighting business of London. Within five minutes from the commencement of the rain, the darkness was such that every shop and office in the affected area wanted to light up as if it had been night. In this office, the editorial rooms were fully lit by gas at 12.35; and at 12.50 it was all over, and the lights were out again. This is a piece of fact which is worth any amount of speculation as to what might happen, or vague remembrance of what did occur once upon a time. Like the traditional "bolt "from the blue," came the thundercloud on a very hot September morning; and within as short a time as a man can find a match-box in the dark, and make use of it, all the gas-burners in our part of the town were in full blast. For twenty minutes only. Realize what this means for the electric lighting plant. One would not care to mention the word "load factor" in the hearing of the Engineers of the City of London Electric Light Company, before the end of the week at earliest. And to think that this sudden eclipse of daylight did not come on while the Company were fighting against the threatened invasion of those who accused them of charging too high a price for their supply! What price, they might have answered, would enable an electric light company to be always ready for such an emergency as this? The gas company are all right. They need not trouble themselves, though the sun disappear from the noonday sky for twenty minutes or so, only to return as bright as ever. The gasholders will settle down a few sheets, and the big trunk-main governors will sing a livelier note for the time being, while the consumers' meters will show where the gas is going; but the town will have its light. That is the great thing; and any system of artificial lighting which does not respond to this need, must go to leeward every time it makes default.

WATER AND SANITARY AFFAIRS.

THE rain which, after some weeks' absence, appeared once more at the close of the past month to refresh the parched ground and replenish the falling rivers and streams, seemed, judging by the extraordinary storm which burst over the Metropolis about midday last Wednesday, to have gathered up all its forces, and concentrated them for a tremendous downpour. In a very short time—comparatively only a few minutes—nearly an inch of rain fell in Westminster (which suffered in a peculiar way from the sudden descent of so much water), and an inch at Brixton. This is more than three times as much, Mr. G. J. Symons tells us, through the medium of "The Times," as fell in the whole of August, and slightly more than the aggregate recorded since very early in July. When it is remembered that an inch of rain means about a hundred tons to the acre, an idea may be formed of the immense bulk of water which fell to the earth last Wednesday. At the residence of Mr. Symons, in Camden Square, half an inch of rain was recorded; but 50 per cent. of it came down in about six minutes—an exceptionally heavy fall. The storm was not confined to London; the Thames Valley towns up to Oxford feeling the effects. In July, rain fell on nine days only in the University city—rather more than half of it coming on one day; but as there was at the close of that month a total deficiency of 3·11 inches for the year, there was necessarily a good deal of leeway to be made up. The effect of the storm on the Thames has been marvellous. A few weeks ago, a great outcry was raised in certain quarters about the low state of the river, which it was said was being "depleted" by the London Water Companies; and a certain amount of alarm was created by the Water Committee of the County Council stating, in the long report they presented just before the recess, that, even if a wet summer supervened upon the drought, the actual total natural flow of the Thames during the succeeding three months (their report was dated July 14) would be "con-"siderably below 300 million gallons," out of which the Companies would require not less than 130 million gallons. A very gloomy picture was drawn of the condition of the river under such circumstances. But what do we find? That the Thames is resuming its normal state—in fact, the volume of water now flowing over Teddington Weir is satisfactory even to the writer of a "special" article on the subject in the "Daily "Chronicle," who grows quite poetical about the Thames Valley "slaking its thirst," and the "streams and "creeks and rivulets that have been dry, or nearly so, "during August, now bubbling merrily again." At the same time, he acknowledges that the quantity of water going over Teddington Weir last week averaged nearly 300 million gallons; and that, inasmuch as the officers of the Thames Conservancy are confident that the increased flow of the river will be maintained until next summer, "all danger from a curtailed water supply can be said to "be at an end for another twelve months." This is a very gratifying admission, and is much better than the gloomy vaticination of the framers of the County Council's report. Moreover, it bears out the opinion expressed in the "JOURNAL" for July 18, based upon what had happened in 1898. It was then acknowledged—it could not, in fact, be denied—that the river was low. But we showed how it recovered itself last year, and inferred that it would do so again. A twelvemonth ago to-day, the flow of water at Teddington was the lowest on record—being only 42 million gallons; but the average daily flow in October was 285 million gallons. We are therefore better off now, notwithstanding the long drought, than we were in 1898; and this year there has been no curtailment of the supply.

As in the Metropolis, so in the Provinces generally,

relief has been afforded by the welcome rain. But this does not mean that there is no longer any necessity for the judicious use of the water in store; and consequently the assistance of consumers in this important matter is still called for. At Leeds especially is this the case. Last Friday, the reservoirs in the Washburn Valley held 1181 million gallons of water, or 43½ days' supply, as compared with 48 days' supply on the corresponding day in 1898. In the twelve months, the daily consumption has gone up from 26¼ to 27 million gallons. Bradford has a supply of water estimated to last 78 days in the low and intermediate levels, and 18 days in the high level, which is being partially fed from the low-level reservoirs. At Stalybridge, the quantity of water in store in the early part of the past week was something like 300 million gallons less than it was this time last year; the result being that there was only three weeks' continuous supply for the town. Stalybridge, it may be remembered, is grouped for water-supply purposes with Ashton-under-Lyne, Dukinfield, Hurst, and Mossley; and the whole district is under the supervision of a Joint Water Committee. The Local Authorities of the above-named places acquired the water-works in 1864; and the Chairman of the Committee (Alderman Fentem) states that he and his colleagues feel more anxiety now than they have ever experienced in regard to keeping up the supply, for they are worse off for water than they have been since the works were constructed. He has cautioned the consumers that not a single gallon should be wasted. The Committee do not, of course, wish to be unduly severe with anyone as to the use of water; but they have set the police on the alert, and any case of waste coming under their notice will result in the party guilty of it being summoned before the Magistrates. This determination to check waste is forced upon all suppliers of water—whether companies or local authorities—in times like the present; but it is curious to notice that while such action is commended in the case of the latter bodies, it is usually condemned when resorted to by the former. Evidence of this was afforded only a few days ago when the East London Water Company decided to proceed against certain offenders. In fact, to paraphrase the well-known couplet, that in the corporation's but a judicious act which in the company is sheer tyranny. It is gratifying, however, to find that the correspondent of "The Times" from whose recent article we quoted last week, considers that the Company have only done their duty in taking out the summonses; and he advises combined action on the part of the Water Companies, who, as he properly points out, "have a common interest in safe-"guarding the public welfare."

Waverley Association of Gas Managers.—The seventy-seventh half-yearly meeting of the Association will be held next Thursday, at Melrose, under the presidency of Mr. W. B. M'Lusky, of Selkirk, who, in his opening address, will suggest topics for discussion. After an early dinner, a visit will be paid to Melrose Abbey.

The Quantity of Naphthalene in Gas: A Correction.—By an unfortunate clerical error, the quantity of naphthalene in 1000 cubic feet of gas was twice given in the article on this subject last week as present in only 100 cubic feet. The following corrections are therefore necessary: Page 591, line 13, for 210 grains read 21 grains; and line 17, for 200 grains read 20 grains.

Coke for Foreign Markets.—The North German Coal and Coke Works, at Hamburg, are building coke-furnaces on the Indian Quay. It is proposed to import British coal to Hamburg, to sift it, and to use the small coal for coke. This coke will find its market in Hamburg and the neighbourhood, and probably the West Coast of South America and Australia. It is thought possible that much trade may be done, as the traffic between Hamburg and the above-mentioned countries is considerable.

Coal-Dust "Briquettes."—According to the Baltimore "American," the soft-coal dealers of that region are much interested in a proposition from Chicago to utilize coal dust at the mines in the manufacture of bricks for heating purposes. The inventor claims that bricks manufactured by his process will yield more heat than either bituminous or anthracite coal in its original form. It is estimated by mine owners that at least a million tons of coal dust are wasted annually, though much is used in filling up swampy land and as beds for railroad tracks. So far as the process of the inventor has been explained, the dust is thrown into a big receptacle, and is carried thence to a boiler, and heated almost to the ignition temperament of the dust. The paste or pitch is then added, and the combination is next passed to a press, where the brick is moulded. It is claimed that in the process of manufacture of the brick the undesirable gases and elements in coal are dissipated.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 657.)

Last week's business on the Stock Exchange was entirely dominated by the position of affairs in South Africa. On the opening day, the markets were sensitive, but fairly steady on the whole; there being a prevailing disposition to speculate on a peaceful solution of the difficulty. But as the days went by, the feeling became less easy and more apprehensive; the culminating point being reached on Friday, the closing day (the Exchange was not open on Saturday), when everything was at its flattest, though the last prices were not the worst of the day. Consols, which had commanded 104⅞ on Monday, were done more than once at 104⅛—the lowest price touched for a long time; and prices all round followed suit, the more speculative adventures being very flat. Money was in abundance all the week, and discount rates ruled easy, though a little more inclined to harden at the finish. In the Gas Market, business continued quiet all through the week, and transactions were unimportant, and did not possess any remarkable interest. A few changes in quotation were the result; but they were irregular, and indicated no general tendency. In Gaslight issues, the disposition to droop which was noticeable a week ago in the ordinary stock continued to rule; and the price on the closing day touched 105½, though there was some little sign of a possible reaction. The secured issues were steadier; and the debenture gained a point. South Metropolitan was quiet, and did not seem disposed to go higher. Commercials also changed hands once at easy figures. In the Suburban and Provincial group, there was very little done; and the only feature was a smart rise in Brentford old, with business marked at 281. The Continental Companies were almost wholly lifeless. European fully paid was fractionally lower; but no business was marked in it. Nothing was observable among the remoter undertakings beyond a fall in Bombay. Business in Water continued very restricted; and the only feature was a big jump in New River, with business marked at 436.

The daily operations were very limited, and varied little from day to day. On Monday, Gaslight ordinary fell 1; but the debenture stock advanced 1. In Water, New River had a rise of 7½. On Tuesday, Brentford old made an advance of 5; but Bombay old fell ¼. No changes in Gas prices were effected on Wednesday; but in Water, Southwark ordinary rose 2. On Thursday, a fall of ½ was noted in European fully paid. No changes were made on Friday; and on Saturday, as mentioned above, the Exchange was closed.

ELECTRIC LIGHTING MEMORANDA.

The Maximum Demand System of Charging for Electricity—Some Drawbacks—Difficulties of Explanation—Is it Legal?

An exhaustive article on the Wright, or Brighton, system of charging for electricity supply lately appeared in "Engineer." Our contemporary declares that the system is "becoming always more widely adopted;" one of the latest instances of its adoption being that of the Chelsea Company, who have started it for the current quarter. On the other hand, it must be admitted that the system is not a general favourite; and the City of London Company have abandoned it as a means of meeting the threatened competition in their district. Seeing, however, that the administrators of a good many electric lighting undertakings actually labouring under the disadvantage of too little patronage for profitable working are sure to have their attention directed to this expedient as an attraction for customers, it will not be trouble thrown away if we follow our contemporary's criticism of the system. It is acknowledged, to start with, that the method is in many respects excellent; and we are not prepared to deny the statement generally, if it is qualified by the admission that its excellence is best exhibited in a residential neighbourhood which keeps pretty good hours. Its object is to offer customers an inducement to keep down their maximum current consumption to as little excess as possible above their daily average; and, furthermore, to put a heavy charge on those consumers who run up their maximum demand to a high multiple of their average. The theory is that the "load factor" of the supplying station is the sum of the "load factors" of the individual consumers. If all the consumers turned on most of their lamps, say, from 4 to 6 o'clock during the winter season, and never at any other time, it is evident that the "load factor" of the station would be a very bad one, and that scarcely any amount of such patronage would make the station pay.

The argument is not always, or everywhere, based upon the facts of experience. If one set of consumers—as the banks—used their lights up to 5 o'clock, and the big shopkeepers kept open until 7 o'clock, when the best private houses began to get ready for dinner, and were followed up by the theatres and other places of amusement until midnight—the sum of all these transient "peaks" of the individual load diagram would be a very comfortable eminence in the shape of a ridge on the station load diagram. It does not appear very clearly why the customer who uses his light only from 4 to 6 o'clock should be fined; nor even the man who uses it from 8 to 11 o'clock. Still less is it

apparent why the man who starts lighting at 4 and continues until 11 o'clock, while all the other "peaks" are popping up one after the other, should have his light cheaper on this account. So strongly is this consideration felt by some of the engineers of London electric lighting stations, that they will have nothing to do with Wright's system. They regard the variations in the hours of lighting as natural and unavoidable, and are averse to worrying the consumer with the thought of what will happen to his quarter's bill if he turns on the light in one room without previously extinguishing it in another, and so on. To the careful and economical householder, our contemporary remarks, "the use of the electric light under these conditions is rather apt to become a nightmare."

There are, however, different classes of consumers from the point of view of an electricity supply undertaking, which is under the necessity of supplying on demand a commodity that cannot be stored. The latter consideration is the excuse for making a classification of consumption upon this basis. Large shops, banks, merchants' offices, places of entertainment, railway stations, factories and workshops, and street lamps, are all desirable customers for electricity supply; because they take a good deal of current, their "peaks" do not all coincide, and they have regular times of lighting up and turning out. Even more desirable customers are clubs, shops, and factories working at night, and private dwellings, because they require the light for many hours. On the other hand, a large establishment of any kind which has numerous lights that are never used but for a brief period during the depth of winter, when everybody else wants the light, is as undesirable a customer as an electric lighting engineer wants to have. A system of charging which puts the maximum price upon the last-named class of consumption, and gives the others in their degree some return for their more paying custom, is manifestly fair all round. This is what the Wright system professes to do. Unfortunately, as our contemporary points out, the manner in which it does it is not very intelligible. It is generally stated as charging a big price—say, 8d. per unit—for the "first hour," and a small price—say, 2d. per unit—for the subsequent use of the lamps.

This apparently simple rule becomes complicated when it is put in practice. It is necessary to find out the maximum demand at any time during the quarter. This is assumed to be taken every day for the stipulated hour, or hour-and-a-half, at the maximum price; and all the rest is priced at the lower rate. Our contemporary puts it that "the principle of the scale, stated in quite simple terms, easily understood by everyone, is to charge at a fixed low rate (*e.g.*, 2d.) per Board of Trade units on the total quarterly consumption, and in addition to make an extra charge in proportion to—so many shillings per kilowatt of —the maximum rate of consumption reached at any instant during the quarter." It is so beautifully simple that the Chelsea Company may charge under their new scale an average price of $4\frac{1}{2}$d., $4\frac{1}{8}$d., $3\frac{9}{10}$d., and any number of other fractional prices up to $10\frac{1}{2}$d. per unit, during the quarter. If the consumers choose to sign an agreement to this effect, we suppose it would hold good in law; but it is doubtful if the scheme could be applied to any consumer's account against his will. The Act empowers undertakers to recover such charges for electricity supplied as may be agreed upon; and any consumer who might consider himself victimized by the Wright system could not be compelled to accept it. Such, at any rate, is our reading of the law.

THE WORK OF DR. POLE, F.R.S.

It was our duty last week to announce the retirement of Dr. Pole from his appointment as one of the Metropolitan Gas Referees. This body thus loses its oldest member; and it is unlikely that in any other capacity Dr. Pole will resume intimate relations with the gas industry. He is now in his eighty-sixth year; and though he carries lightly the weight of so many years, and appears to enjoy reasonably good health, he is no doubt well advised in wishing to be free from the responsibilities of official and professional engagements. His life so far has been singularly active; and we expect, and hope, still to see him figuring as a writer in the high-class journals and reviews to which he has been accustomed to contribute. But we may opportunely, at the close of his career as a Gas Referee, review his work as a gas and water engineer, and incidentally refer to his labours and achievements in other capacities.

Birmingham was Dr. Pole's native town. He was articled at the early age of fifteen to an engineer there, who was the local representative of the Horseley Iron Company. He migrated to London, however, when he came of age in 1835; and, after some temporary appointments, became Manager to Mr. T. G. Barlow, the well-known gas engineer and founder of the "Journal." In 1840, he joined the Institution of Civil Engineers, of which he has been recently created an honorary member, after having served as Honorary Secretary from 1885 to 1896. In 1844, he went to Bombay to take up the duties of Professor of Engineering at the Elphinstone College, which had been established for the technical education of natives about to enter the public service. In 1846, he married; but his prospects of a career in India were marred shortly afterwards by the discovery that his health was being seriously undermined by the climate. He resigned his Bombay appointments, and returned to London in 1848. He then became Manager to a hydraulic engineer, and was engaged in the establishment of the Lambeth Water-Works at Thames Ditton. He gave special attention to the pumping machinery, and brought out a new design for pumping-engines. In 1852, he went to assist Mr. J. M. Rendel in harbour and railway works; and in 1857 he accompanied Sir John Fowler to Algiers to survey (on behalf of the French Government) the route of a projected railway. In 1858, he commenced practice in London as a Consulting Engineer.

About the same time also Dr. Pole was engaged by the Government to assist a Commission appointed to investigate the Metropolitan main drainage. Thereafter, until his resignation of the post of Gas Referee on the 31st ult., he has been almost continuously engaged in official work for one or other of the Government offices. He was one of the Select Committee appointed in 1861 to report on the application of iron armour to ships and fortifications; he was Secretary to the Royal Commission formed in 1865 to report on railway legislation, and to the Royal Commission appointed in 1867 to report on the water supply of the Metropolis. In 1871, he drew up the elaborate reports on the constant-service system of water supply that led to the passing of the Act which established that system for the Metropolis. He was Secretary to the Royal Commission formed in 1882 to investigate the Metropolitan sewage discharge; and he drafted the two reports made by that Commission. He has had many other, but less important, engagements under the Government. It was in 1870 that he was appointed one of the Gas Referees; his first colleagues being Messrs. J. S. Pierce and R. H. Patterson, who were shortly afterwards superseded by Mr. A. Vernon Harcourt and Professor Tyndall. Dr. Pole, therefore, has held the appointment for 29 years. As early as 1852 he had written for the "Journal" an essay on the motion of fluids in pipes, which embodied calculations he had made on the distribution of gas in London. In 1870, he communicated to the "Journal" his theory of gas-burners, which is set forth at considerable length by Mr. Dibdin in his "Practical Photometry." In other journals he has written freely on various engineering topics. From 1859 to 1867, he was Professor of Civil Engineering in University College, London.

The above is a brief statement of the more important episodes in Dr. Pole's strictly professional career. In several other pursuits, however, he has gained for himself unusual distinction. He is a musician of exceptional ability. At the age of 17, he was able to obtain payment for his services as organist at a place of worship in Birmingham. In 1836, he became Organist at St. Mark's, North Audley Street, London; and he only severed his connection with that church in 1866. In 1860, he obtained the degree of Bachelor of Music at Oxford University, and was enrolled on the books of St. John's College. In 1867, he obtained his Doctorate, after performing an exercise in eight vocal parts with full orchestral accompaniment. His Examiners were Professor Ouseley, Dr. Corfe, and Dr. Stainer. In 1879 was first published his "Philosophy of Music," which has now passed through several editions. From 1878 to 1891, he was one of the Examiners in Music in the University of London.

Dr. Pole has always taken a great interest in card games; and a reference to whist which he made in an article on "Christmas Games" in "Macmillan's Magazine" in 1861 brought Henry Jones, better known as "Cavendish," into correspondence with him. The upshot of the correspondence was the publication of "Cavendish's Whist" in 1862. In 1864, Dr. Pole wrote his "Theory of Whist;" in 1883 his "Philosophy of Whist;" and in 1895 his "Evolution of Whist." These works, of which the first-named has passed through more than twenty authorized and numerous pirated editions, are known to all whist players.

A peculiarity in his own vision led Dr. Pole to study colour blindness; and in 1856 a paper by him on this subject was presented to the Royal Society, and published in the "Proceedings." He has continued from time to time his observations on the colour sense, and so late as 1893 he read a paper on "Colour Blindness" before the Royal Society of Edinburgh.

Dr. Pole has also taken high rank as a biographer. He wrote five chapters in the "Life of Robert Stephenson," which was published in 1864, and the chapter on "The Gauges" in the "Life of I. K. Brunel," published in 1870. He prepared in 1875-7 a life of Sir William Fairbairn, Bart., the eminent Engineer; and in 1884-8 he compiled the "Life of Sir William Siemens," which was afterwards translated into German.

Dr. Pole is an expert mathematician and a good linguist. No small measure of his success as an engineer appears to have been due to his mathematical attainments. He studied languages from an early age, and has improved his knowledge thereof by Continental travel, of which he has always been passionately fond. His work has brought him many honourable distinctions. In 1883, he received from the Mikado a special decoration—the Japanese equivalent of the English K.C.B.—in recognition of his services since 1871 as Consulting Engineer on the railway system of Japan. In 1861, he was elected a Fellow of the Royal Society; and in 1875, and again in 1888, he was one of the Vice-Presidents of the Society. In 1864, he was elected, without ballot, a member of the Athenæum; and in 1877 he became a Fellow of the Royal Society of Edinburgh. His long and honourable association with the Institution of Civil Engineers has already been referred to.

Dr. Pole has been a prolific writer on many subjects. He has contributed to "The Times," the "Quarterly Review," the

"Fortnightly Review," the "Philosophical Magazine," "Macmillan's Magazine," and many scientific periodicals besides the "JOURNAL." No doubt the energy of his remaining years will find an outlet in literary exercise, such as he has become accustomed to in the past. He has a clear and easy style, and an aptitude for exposing the kernel in recondite problems. His lofty sense of responsibilities and his fine conscientiousness impress all who are brought into personal contact with him; while his kindliness and courtesy endear him to them.

THE REPORT OF MR. CHAPLIN'S COMMITTEE ON AGED DESERVING POOR.

THE news that Mr. Chaplin's Committee, appointed to consider the case of the Aged Deserving Poor, had succeeded in producing a report in favour of a National Pension Scheme, came as a surprise to a public who had shortly before been informed, on the authority of Lord Rothschild's Committee, that nothing practicable of the kind was in sight. We have discussed the report of Lord Rothschild's Committee at length, and borne regretful testimony to the stern logic of its conclusions—regretful, because, on the face of it, the reflection that there is nothing better than the workhouse for men who have laboured hard all their lives and remained poor through no fault of their own, is depressing. At the same time, writing as representing a great national industry, it behoves us to be circumspect and keep the sentimental aspect of such a matter in its proper place. The example of the Workmen's Compensation Act is a standing warning of the manner in which future statutory improvement of the circumstances of the working population of this country may likely be brought about. During the debates on this measure, the principle was laid down, and accepted by both Houses of Parliament, that the national industries ought to provide for their own human waste. The expression is somewhat crude, perhaps; but that is what the Workmen's Compensation Act really means. It is itself only the beginning of a movement in politics of which it is impossible to foretell the end.

It is at least possible to see, however, and we have all along admitted, that a scheme of honourable provision for those who are past work is the natural development of the principle underlying the Workmen's Compensation Act. If industries are to provide for their own killed and maimed, it is only a question of arrangement how they are to provide for their old hands. This is already done in many cases; and every successful works' pension scheme renders easier the ultimate generalization upon these various independent particulars. Hitherto, the inquiries that have been conducted into the general question of Old Age Pensions have not proceeded from this starting point. The Royal Commission under Lord Aberdare, and the Treasury Committee under Lord Rothschild, were general inquiries of this character. Not unexpectedly, their labours were barren of positive results, inasmuch as the problem presented to them was nothing less than the elimination of undeserved poverty from our midst. The conscience of the community, however, declined to accept these negative criticisms as conclusive. The findings of Lord Rothschild's Committee, indeed, would have uprooted the Poor Law itself. Public opinion, voiced on several occasions by members of the present Government, refused to believe that the great law of Elizabeth is the last word of civilization on the subject of the relief of the aged poor. This was the real ground for the appointment of Mr. Chaplin's Committee.

To begin with, it must be conceded that, as regards repute of knowledge, this latest Committee is not to be compared with either the Royal Commission or Lord Rothschild's Committee. The country has never taken Mr. Chaplin very seriously; and his Committee was a heterogeneous team of professed Socialists and "faddists" of different brands. Yet there were several good names among the party; and some of the best of these were appended to the majority report. It was no light matter for Mr. Chaplin's string to follow after Lords Aberdare and Rothschild; knowing that, unless they could adduce grounds for reversing the judgment of their precursors, their inquiry would be worse than vain. Yet, what chance had they of succeeding in finding a solution that had eluded those who had gone before them? Could they hope to arrive at a different conclusion from the same premises, or discover some "new fact" pregnant with fresh light on the dark subject?

It appears to us, at the outset, that Mr. Chaplin's Committee took a wise resolution in basing their search for means of ameliorating the lot of the aged poor upon the established ground of the existing Poor Law and its administration. This course not only gave them a fixed datum; but it also offered the advantage of anticipating any theoretical criticisms that the stern, unbending political economists might bring to bear upon their ultimate findings. For the English Poor Law, as is universally admitted, is in flat contradiction of the first principle of political economy so lucidly enunciated by St. Paul. We have people among us who do not work, and yet we do not let them starve. Having accepted so much responsibility, in defiance of political economy, the rest is only a question of degree. This is the point where the interest of the ratepayer comes in. An old and uncontradicted dictum tells us that we can have as many paupers as we like to pay for. The history of Poor Law administration is replete with proofs that the whole question is one of administration only, after the principle is accepted that the poor shall be relieved at the public charge. The great industries of the country have succeeded to the position which was formerly occupied only by the large landed proprietors; and on them consequently falls the heaviest charge, while they have the least to say regarding the expenditure of relief.

The chief weakness of the report of Mr. Chaplin's Committee is that it does not take sufficient account of the position of employers of labour, either as ratepayers, or as the agents whereby industries already take care of their workpeople. The Committee say that in dealing with the question of Old Age Pensions, there is to be borne in mind the painful position and the hardship of the resourceless poor; and also the marked development of the efforts of the poor to help themselves. Their efforts were consequently directed to devising the means of "making kindlier and more human provision for the one class without doing anything to discourage or arrest the laudable efforts of the other." This is very well so far as it goes; but it does not go far enough. It is remarkable that the Committee did not even mention the third consideration pertinent to this inquiry—the existing and prospective pension funds connected with industrial employments. The omission is grave enough to warrant the return of the report for its inclusion.

Any extension of Poor Law relief, by whatever name it may be called, necessarily means higher rates; and it appears to us that before appealing to the Imperial Government to bear part of the increased burden, the extent of the local resources should be resurveyed. In any case, the responsibility of employers of labour comes into question. The recommendation of Mr. Chaplin's Committee is to the effect that any British subject, of 65 years, who has not been a criminal nor a pauper for 20 years, who is resident within the district of the Pension Authority, who has less than 10s. per week of his own, and has done his best to make provision for himself, shall be entitled to a pension. The Pension Authority is to be constituted of a Committee composed of the Guardians of the Poor and others in every Union; and one-half the cost of the pensions awarded would be borne by Imperial taxation—the basis of contribution being the population of the district.

These recommendations appear to us to be admirable for some reasons, and objectionable for others. They are to be praised for their positive character. It is something to get away from the hard *non-possumus* of the previous inquirers; and to know that there is yet another way of doing what is already being done more or less successfully by scores of devices, governmental and otherwise. On the other hand, the recommendations of the Committee do not amount to very much more than "pious opinions," in the absence of any adequate actuarial statement dealing with ways and means. The chief drawback to the utility of the report, we must repeat, is its disregard of the Workmen's Compensation Act and of existing pension schemes. The report may serve as the starting point of another inquiry, which might be commenced next session, in which all these considerations should be reckoned with. It is one of the gravest objections to the Workmen's Compensation Act that it has injuriously affected certain private arrangements previously established by large employers of labour, including some Railway Companies and Miners' Boards. Without stopping now to inquire too curiously into the foundation of these complaints, it is clear that a much graver objection would lie to State interference with any working pension schemes. All the recognized objections to official discouragement of thrift on the part of the working classes themselves can be urged with equal force against any injurious supersession of long service pensions attached to the employment. Besides, every working arrangement of the kind reduces by so much the remaining problem. As the Committee perceive, the amount of labour which would be affected by a general pension scheme after the age of 65 is comparatively small; and it would be still smaller if the actual and prospective employers' schemes were fairly allowed for.

This is a matter in which administrators of the gas undertakings of the United Kingdom might and ought to take a leading part. It should be a point of pride with gas companies and committees that no deserving worker of theirs ever went into the workhouse. Thrift is a good thing, and ought to be encouraged on all hands; but there are circumstances which keep some men poor, while others save money and become independent. It is not necessarily the most saving man who is the best workman, or even the best citizen. As it has been in the history of the world, so it is in that of individuals, the policy of the "bit in the stocking" has done less to widen the frontiers of civilization than its opposite. Unfortunately, the individual is liable to suffer from this fine recklessness of personal consequences which is a racial characteristic of Englishmen. When this happens, the conscience of the community is shocked, and not all the maxims of political economy will salve the smart. Political economy is affronted every day, as it is, by relief funds started to compensate the sufferers from any calamitous occurrence on a sufficiently large scale to arouse the public's feelings of pity. What is wanted is to replace the spasmodic by the systematic relief of suffering and distress. Old Age is the one incurable disease, for which alleviation should be found in any system of civilization worthy the name.

RECENT PUBLICATIONS.

The Merchants' Handbook of Money, Weights, and Measures, with their British Equivalents. By W. A. Browne, M.A., LL.D. Fifth Edition. (Edward Stanford.)

Dr. Browne is one of those who are of opinion (to quote from his preface to the present edition) that "if people only knew how simple and easy the decimal metric system of weights and measures is, and how very greatly it facilitates calculations and computations, they would eagerly and universally adopt it;" and that "its general adoption would save much time in the school and the counting-house, and would give a powerful impetus to trade and commerce." We will not now repeat the many reasons which force us to the conclusion that, whatever the theoretical advantages of the metric system may be—and we have recently disputed at some length as to whether those advantages have proved, or would prove, as great in practice as they can be made to appear on paper—the difficulties that lie in the way of its general adoption in this country are so great (if they be not actually insuperable) as to remove the question from the area of practical to that of academical discussion. We see no reason to qualify our expressed opinion that "if any English Government were to propose to establish the metric system compulsorily all over the United Kingdom at the expiration of a period of grace—say, two years—there would be such a storm of popular opposition that the Bill would be dropped without delay."

Such being, in our view, the case, we welcome with the greatest cordiality the appearance of a revised edition of Dr. Browne's very full and complete handbook of the money, weights, and measures of all lands under the sun, with their British equivalents. The work literally ranges from China to Peru, and contains in a compact form all the information respecting foreign currency and standards that the merchant can require. Special attention is, naturally, paid to the European countries; the information in regard to Germany—embracing as it does the tables for all the individual States—being particularly exhaustive. To all companies having transactions with the Continent, or any other part of the world, this book will prove of the greatest convenience.

Dr. Browne repeats the oft-heard complaint that British foreign commerce is seriously hindered by the fact that British merchants and manufacturers send out their estimates, their invoices, their catalogues, and their trade circulars drawn up only in English, and in the denominations of British imperial currency, weights, and measures, instead of in those of the importing country. For this there is, we fear, considerable foundation; but without wishing to excuse the folly of merchants guilty of such practices, we must remark that Continental traders are by no means free from the same irritating custom. Invoices for foreign goods, or tenders for English goods, are frequently received in this country in the denominations of the country from whence they come. We cannot therefore quite believe in the supposed paralyzing effect of such practices upon trade, for the senders of the invoices could not resent receiving accounts for English goods in English terms; while, on the other hand, the Continental merchant capable of rendering his own invoices in English would have even less difficulty in translating English language, money, or weights into the terms of his own currency and standards. With, however, a work so complete as that under notice obtainable for five shillings, there exists no excuse for the continuance of a system which, even when it does not actually injure trade, is frequently a cause of annoyance.

Dr. Browne puts forward a suggestion which, if acted upon, would make the adoption of the metric system in this country less impossible a quarter of a century hence than it is now. We are very sceptical as to whether the standards of that system are sufficiently convenient to make their adoption desirable, even if it were rendered possible; but the carrying-out of Dr. Browne's suggestion, so far, at any rate, as specifically commercial education is concerned, would make for good. His suggestion is "that the metric system of weights and measures should be taught as a compulsory subject, a necessary part of arithmetic, in all public and elementary schools, and that instruction in decimals should be given immediately after the simple rules." We need scarcely point out that familiarity with the metric system is essential to all students intending to take up chemistry. With all due respect, however, to Dr. Browne and the Decimal Association, we are of opinion that the time is far distant when the value of the handbook of the former will be diminished by the achievement of the objects of the latter.

Our only criticism—and it a small one—is that the contents table, though very full, does not altogether supply the want of an alphabetical index, particularly as the order of the contents is somewhat haphazard.

Carbon Compounds. By R. H. Adie, M.A., B.Sc. (W. B. Clive.)

The study of organic chemistry forms a necessary part of the education of the gas engineer; coal being what is known as an organic compound, and its destructive distillation producing an almost limitless variety of other such compounds—principally of the order of hydrocarbons. We ought, perhaps, to have said that such study should, rather than that it does, form part of all education; for, at any rate in the past, scientific knowledge has been only too frequently conspicuous by its absence from the equipment of the average engineer. The combination of scientific with practical knowledge has been even more rarely observed. It will hardly be denied that further scientific examination of the phenomena of the destructive distillation of coal is much needed, and would prove of the greatest value to the profession in general. Fame awaits the student who shall successfully solve the problem of the certain prevention of naphthalene deposits; and this solution, we are confident, will only be found by scientific experiment and observation.

To the student of that branch of chemistry which is generally, if not altogether correctly, spoken of as "organic," Mr. Adie's "Introduction to the Carbon Compounds" will be found useful and helpful. It is not—it does not pretend to be—a treatise on Organic Chemistry; but its object is to form an introduction to the consideration of the more important groups of carbon compounds, and to provide a series of experiments which, if worked as well as read through, will render the student familiar with the chemical relations and properties, and also the practical analysis of those compounds. Those actually examined and described by Mr. Adie have been selected especially for students preparing for the Intermediate Science and Preliminary Scientific Examinations of the London University, and the First M.B. Examinations at the University of Cambridge. Illustrations are given of the apparatus required for the experiments.

Provision for Old Age by Government Action in Certain European Countries. Board of Trade (Labour Department), C. 9414.

We have recently given some account of what has been done, and what proposals are under discussion for doing more, in France to encourage and assist institutions for insuring against the necessities of old age (*ante*, p. 480). The Labour Department of the Board of Trade have now collected and published some information respecting the action of such of the Governments of Europe as have taken any steps for making, or encouraging their subjects to make, provision for old age. The following particulars, taken from the introduction to the detailed memoranda, give a general idea of what has been effected in this direction by our Continental neighbours.

Of the eleven countries dealt with in the report, only two—Germany and Denmark—can be said to have adopted a general system of pensions or relief in old age. Under the German law of 1889, modified by subsequent enactments, there is a general system of compulsory insurance against old age and invalidity. In the year 1897, over 400,000 persons drew pensions amounting to no less than £2,750,531, of which £1,079,823 was provided by the State. Of the above amount, about half was expended on old age and half on invalidity pensions.

In Denmark, the system adopted is very different; the law of 1891 providing for a special form of old-age relief to necessitous persons of good character. There are no direct contributions by the recipient; and the amount of the pension is not fixed by the law, though it must be sufficient for the needs of the applicant and his family. Receipt of this relief does not impose electoral disabilities. In 1896, 36,246 persons, with 14,223 dependents, were receiving pensions under this law, amounting to £216,317, of which roughly half was paid by the State and half by the Communes. [There is, it will be observed, very little difference between this system and the granting of outdoor-relief to the aged by the Guardians of the Poor in this country, except in so far as the questions of electoral disability and State subvention are concerned, and that Poor-Law Guardians may, and often do, insist on granting indoor-relief only except in special cases.]

While the above seem to be the only countries in which general State schemes for old-age pensions are in force, there are several cases of partial schemes in other countries. In France, the State encourages provision for old age in several ways. In the case of seamen and miners, such provision is obligatory; and the Government makes a grant of £440,000 per annum to the fund from which seamen's pensions are paid. Moreover, the State gives subventions to the pension funds of Friendly Societies, besides subsidizing the *Caisse Nationale des Retraites pour la Vieillesse*, and giving a grant in aid of pensions provided for necessitous persons by Departments and Communes. Altogether, the State expenditure on old-age pensions in France is probably not less than £600,000 a year.

In other countries less has been done by the State. In Belgium, the Government and certain provincial authorities make grants to encourage Friendly Societies to induce their members to subscribe through their medium to the *Caisse Générale d'Epargne et de Retraite*. In some districts of Belgium, old-age pensions are granted to persons formerly engaged in mines, out of funds to which mine-owners are compelled to subscribe. In Austria, there is a system of compulsory contributions by mine-owners and miners to funds from which pensions are granted to aged workmen. In Russia, old-age insurance only extends to Government mining establishments; while in Roumania, where compulsory insurance in mines and quarries was enacted by a law of 1895, the law is not yet operative owing to the fact that no enterprises to which it applies have been started. [This is a remarkable instance of anticipatory legislation. Imagine the House of Commons legislating for an unborn industry!]

In Sweden, Norway, and Holland, the question of Government action in the matter of old-age pensions has not gone beyond

the stage of projects—a stage notoriously easier to reach than to advance beyond; while in Italy, the law of 1898 to establish a National Pension Fund will not come into force until a month after the publication of an as yet unpublished Royal Decree approving the rules.

The information given in the report, of which the above is a bare summary, has been verified and corrected by Her Majesty's representatives in the several countries referred to. In addition to details of the various Government schemes, particulars are, in most cases, given of the number and strength of the Friendly Societies, and of the share taken by them in providing means for insuring maintenance in old age. The report is well edited, but like all Government publications, is spoilt by being sewn. Sewn books and pamphlets are an abomination.

THE LATE ROBERT HUNTER.

It may be remembered that at the time of the death of the late Mr. Robert Hunter, of Chester, in the autumn of last year, an appeal was made in the "Journal" for subscriptions to assist Mrs. Hunter in the education and starting in life of her large family; and at the same time a fund was raised by the Manchester District Institution of Gas Engineers, of which body Mr. Hunter was for many years a prominent member. The funds together reached a total of £435 8s. 11d.—namely, £131 18s. 11d. from the Manchester Institution and £303 10s.* as the result of the "Journal" appeal. After consultation with Mrs. Hunter, it was determined to place the total amount under the control of Trustees; and the necessary formalities for this purpose have now been completed. The £435 8s. 11d. has been invested in the names of Mr. W. S. Haddock, the Gas Engineer to the Warrington Corporation, who was President of the Manchester Institution at the time the fund was started, Mr. Donald D. Macpherson, of Bexton Croft, Knutsford, and Mr. Walter King, with absolute power to administer the same at their discretion.

Mrs. Hunter wishes us "to express her very sincere and heartfelt thanks for the great kindness and assistance extended to her and her children. She has no desire to touch the principal, but feels great comfort in the assurance that all her children will be properly educated and helped forward in life, and that there is this very considerable sum for them to fall back upon should ill-health prevent her doing her share towards the bringing up of her family."

Besides the above sum, Mr. W. W. Woodward, of Bromley, who first joined the gas profession under Mr. Hunter's management, has undertaken to bear half the cost of the education of one of the sons. The fourth child, May Hunter, aged 10, is a candidate for admission to the Royal Masonic Institution for Girls, at the October election; and either Mr. Macpherson or Mr. King will be pleased to receive votes which any Masonic Brethren may have to spare, to further her election.

OBITUARY.

Mr. George Dawbarn, the Chairman of the Gas and Water Companies of Wisbech, died yesterday week. He was an Alderman and former Mayor of the borough, and was in his 79th year.

Last Sunday week, Mr. John Rowland, J.P., a well-known North of England shipowner, who was Chairman of the Whitby Water Company, and connected with several other local undertakings, died suddenly during service at the Goathland Parish Church. He was 67 years old.

PERSONAL.

Mr. Robert Gilmour has sent in his resignation of the post of Engineer to the Greenock Water Trust, which he has held for about seven years.

Alderman G. Fox has resigned the chairmanship of the Dewsbury Corporation Gas and Electricity Committee; and Mr. A. Oldroyd has been chosen by his colleagues to succeed to the office.

The report of the Directors of the North Middlesex Gas Company announces that Mr. Ernest L. Burton has accepted the secretaryship; and the post of Auditor which he formerly occupied will be filled by Mr. Lewis Hardy.

The Deputy-Chairman of the Gas Committee of the Manchester Corporation, Mr. Thomas Briggs, has consented to accept the Lord Mayoralty of the city for the coming municipal year. Mr. Briggs has been a member of the Gas Committee about nine years.

Mr. Joshua Cartwright, the Borough Engineer of Bury, has resigned his appointment; and the Town Council have shown their confidence in him by appointing him their Consulting Engineer, and to carry out new works required by the Water Act. Mr. Cartwright went to Bury in 1877 as its first Engineer after incorporation, previous to which time he was Water Engineer at Dukinfield.

* The names of the contributors to the fund appeared at the time in the "Journal," the last amount acknowledged being on Jan. 17. Subsequently an amount of £2 2s. was received from Mr. Bertram H. Peacock, of Sydney, through Mr. James Braddock, of Radcliffe.

TECHNICAL RECORD.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

Quarterly Meeting at Blackpool.

The 119th Quarterly Meeting of the above-named Institution was held on Saturday last at Blackpool, under the presidency of Mr. R. G. Shadbolt, of Grantham.

Visit to the Gas-Works.

The proceedings opened with a visit to the Corporation gas-works, which the Chairman and members of the Gas Committee had kindly thrown open for inspection. Mr. John Chew, the Gas Engineer to the Corporation, conducted the members over the establishment, and explained the various points of interest and novelty. These works have been considerably enlarged since reference was last made to them in the "Journal;" and a few notes as to recent extensions may therefore be of interest. In the retort-house, the whole of the space available is now in use—100 retorts having been put up during the past year; bringing up the total number to 372. All these are of the horizontal type, with regenerator fires. The foundations have also been put in for a new washer-scrubber, which is being erected by Messrs. Kirkham, Hulett, and Chandler. The purifying plant has been considerably enlarged; the number of lime purifiers having been increased to three, each of which measures 45 feet by 25 feet. During the visit, great interest was taken in the Pelouze and Audouin condenser, made by Messrs. R. & J. Dempster, Limited, which was erected a few years back, and has given every satisfaction as a tar-extractor; while another noteworthy addition to the plant is a new enricher for improving the quality of the gas by benzol or light oils. This was put up by West's Gas Improvement Company, Limited; and many comments were made on its handiness and utility, especially by the managers of small works, who thought it was particularly adaptable in such cases as theirs. In the sulphate works, a new superheater by Messrs. R. & J. Dempster had just been set in operation on the day of the visit; and, in connection with this department of the works, reference may be made to a novel method devised by Mr. Chew for disposing of the "devil" water. This is re-pumped into the still; the sulphuretted hydrogen being sent forward to the purifiers, and recovered in the oxide as sulphur. The most important part of the extensions, however, is a new gasholder, erected by Messrs. Clayton, Son, and Co., having a capacity of 1½ million cubic feet. It has three lifts, each 150 feet by 32 feet. The tank was constructed by Messrs. Dent and Son, of Nelson. It may be added that the Corporation have acquired six acres of land on which new works are to be erected; and the Council have sanctioned an application to the Local Government Board for authority to borrow £86,000 for extension purposes, which will include the provision of a new reserve water-gas plant of about 500,000 cubic feet capacity per day. The extensions will also comprise railway sidings sufficient for both works.

At the close of the visit, the members proceeded to the Palatine Hotel, where luncheon was served. After luncheon,

Mr. William Carr (Stalybridge) moved a hearty vote of thanks to the Corporation of Blackpool, for their invitation to the members to inspect the gas-works, and for the very cordial reception that had been given them. He said it was very interesting to go through the splendid works they had visited that morning; and the inspection must have afforded a treat to many gas managers who had not the opportunity of seeing such a place every day. The various points of interest in the works had been very lucidly explained to the party by their esteemed member Mr. Chew. He (Mr. Carr) thought it was a very admirable thing on the part of corporations who owned gas-works that they should encourage gatherings of this kind, for the interchange of ideas and opinions, not only that those participating therein might meet each other, but that by visiting the various works they might pick up hints as to what to adopt and what to avoid in their own places. All corporations were not like that of Blackpool; but generally he found that, where they had a good Gas Engineer, they had also a good Gas Committee. He (Mr. Carr) was quite sure that the Corporation of Blackpool were very fortunate in the selection of their Gas Engineer, and still more so in having been able to retain his services for a period of something like thirty years. Blackpool had a very special interest for him (the speaker), as a gas engineer; and he thought all people connected with gas, either as makers or shareholders in gas companies, ought to view it in the same light. He remembered going to Paris in 1878, when the gas industry was threatened with extinction by a new electrical illuminant that was going to perform marvellous things. It certainly created a great stir, and caused the price of gas to be considerably reduced in this country in a short time; but that illuminant had passed away, and gas was still going on. Not much later, he came to Blackpool, and saw what was probably the earliest electric lighting installation in the North of England. He did not think the Blackpool Corporation were governed by economical motives in putting in the electric light. They had been very enterprising and progressive, but more with an idea of making the place attractive to visitors than with a view of saving the ratepayers' money; and if anything great could be done with the electric light, it had been done in Blackpool. If it had been at all possible to extinguish the gas industry anywhere, there

ought to be no gas made in Blackpool that day. But what was the actual state of affairs? They had just seen, in going through the gas-works, new buildings put up here and there, and likewise a new gasholder—the largest they had ever erected, and one which a few years back would never have been dreamed of in the town. Mr. Chew had informed him that he came to Blackpool when the output of gas was only 15 millions, and now it was over 400 millions, with an increase during the last six months of about 20 millions. It was a large increase, and was obtained in the face of an opposition which had been pushed regardless of financial considerations. This was a great tribute to the utility of gas, and ought to give encouragement to them all as showing what gas could do, and how it could hold its own against the strongest opposition from the electric light.

Mr. ROBERT PORTER (Elland) seconded the motion; and in doing so observed that he looked back with pride to having received his first introduction to the gas world at the Blackpool works, under Mr. Chew. It was close upon twenty years since he (the speaker) started there; and he had very great pleasure in seconding the proposition.

Mr. BATTERSBY, Chairman of the Gas Committee, in responding to the vote, said he thought the works stood in pretty high repute as regards the apparatus and the general results obtained. He was sorry the Mayor had been prevented from attending by an urgent engagement elsewhere.

Mr. CHEW remarked that in Blackpool they were not afraid of the electric light, and never would be. If they put the same energy into gas making as they had done during the past twenty years, they would have nothing to fear. Of course, corporate bodies were inclined to promote the favoured-child—that was the last born—which was the electric light; and, as they all knew, the elder son was sometimes heavily taxed to support the younger members of the family. He might say that their capital to-day was about £140,000; and the Corporation had spent about £120,000 or £130,000 on the "younger child." His advice to gas people was: "Cut your capital down as much as you can. We have to compete with this younger child, which is favoured at every point." They must face the position like men belonging to the gas world, who had had long practical experience. They must not sit down quietly, and think they knew everything—that everything was in their favour, and that their custom was ready made for them whether they stirred themselves or not. Let them rouse themselves and put gas in the forefront for lighting, heating, and cooking. There would then be a great future for it. He was a holder of gas stock, and had no disposition to sell it. He would not sell it to-morrow, even at a premium.

Mr. FLETCHER said he did not know whether or not any other towns had felt the benefit of gas in the same way as Blackpool. They must remember that in that town they built something like two or three houses every day in the year, and had been doing so for many years past. Now they could not build houses without chimneys; and a great controversy had been going on for a long time as to the best plan for doing away with smoke from chimneys. In Blackpool, this problem was being solved. Very nearly all the cooking in the town was done, during the summer time, by gas apparatus; and had it not been for these cookers they would have had a different atmosphere in Blackpool than they had that day.

THE BUSINESS MEETING.

After lunch the business meeting was held—Mr. SHADBOLT presiding.

NEW MEMBERS.

The minutes of the previous meeting having been read and confirmed, the following gentlemen were, on the motion of Mr. W. DUFF (Morecambe), seconded by Mr. R. PORTER (Elland), elected members of the Institution: Mr. T. Davies, Llandudno; Mr. A. F. Goodson, Heckmondwike; Mr. J. Lee, Carnforth; Mr. E. Shaul, Penrith.

Mr. W. WHATMOUGH (Heywood) then read the following paper:—

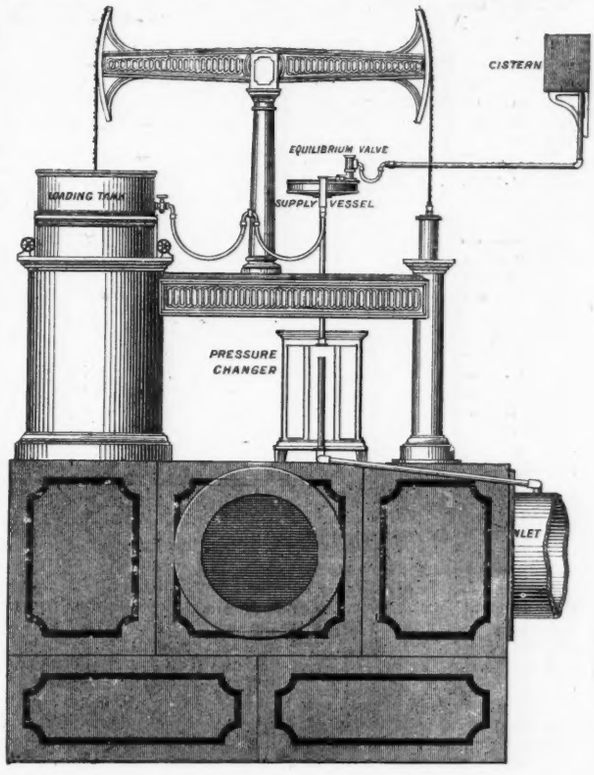
NOTES ON THE WORKING OF A SELF-LOADING GOVERNOR.

The question of the automatic regulation of gas pressure has in recent years been frequently discussed at the various meetings of Gas Associations; but as the principles involved have been based upon the regulation of pressure at the point of supply, I thought it might be of interest to the members of this Institution to give the results of the practical working of the self-loading governor in use at the Heywood Gas-Works. The district of supply is a scattered one, with about 40 miles of mains; the works being situated at the lowest level, with the exception of a small portion of the district about two miles away, which has a special main and governor. The remainder of the gas supply (or 98½ per cent. of the whole) is passed through what is termed the town governor.

It was in the autumn of 1893, in consequence of the town governor being old and unsatisfactory, that my Committee decided to fix a new one with 21-inch connections, in order to provide for future demands; the trunk mains being 18 inches in diameter. The new governor is one of the latest designs of Messrs. Braddock, arranged with two valves balancing each other, and acting in opposite directions in combination with the bell of the governor, and which is also well adapted for the attachment of the automatic pressure-changer made by the same firm. After the governor had worked successfully for about six months, the question of automatic regulation of pressure was taken into consideration; and although the principle of self-loading governors had not been very favourably received, yet the apparatus was so simple, and in the experimental stage so effective, that a trial on a practical scale was decided upon. The apparatus was fixed and completed in February, 1894; but before fixing it, however, the portable pressure-register was placed at various levels in the district, in order to ascertain the minimum and maximum pressures required to give a satisfactory supply. These were found to be 8-10ths and 20-10ths respectively; and the governor was regulated accordingly.

The arrangement is designed to give automatically an increased and diminished outlet pressure as required, although the inlet pressure may vary. The drawing shows the arrangement as applied to our station governor, and which consists of a loading-tank charged with water, fixed on the bell of the governor, the supply of which varies automatically according to the demand for the supply of gas. In order to compensate for the varying inlet pressure, a bell and float are fixed, which work in a small tank, and vary in height (according to the inlet pressure) by means of a small pipe connected to the inlet-main.

On the top of the bell and float is a small vessel supplied with water, controlled by an equilibrium valve which regulates the water for the loading-tank, and is connected by a flexible tube, so that the level of the water is the same in both the vessel and the loading-tank. The vessel also has an overflow to carry



off the surplus water when the demand for gas decreases. There is provided a cistern for the water supply, which is controlled by a ball tap; and the pipe from the cistern is connected to the equilibrium valve referred to.

The pressure-changer is very simple in its operations. Immediately the bell of the governor falls, the equilibrium valve which controls the supply of water responds to the call, and the additional pressure required is given. When the governor-bell rises, the converse takes place, and water is thrown off the tank, and the pressure reduced. As we have a plentiful supply, the water is allowed to run to waste; but if required, arrangements could be made to use it over again. The quantity needed, however, is only small—being about 2 gallons for the largest opening of the bell when putting on the pressure from the minimum to the maximum.

In the working of the governor, however, and when loaded to give the maximum outlet pressure, the bell has a tendency to rise and partially close the valve when the inlet pressure increases, which would cause some of the water to be thrown off the loading-tank and reduce the outlet pressure. This is obviated by the bell and float, which are subjected to the inlet pressure, rising to the same extent as the governor bell, and maintaining the level of water in the loading-tank, and consequently the maximum pressure also. The governor may be loaded by weights or water in the ordinary way if required, by closing the water-supply tap attached to the loading-tank and connected to the flexible tube.

From the foregoing description, it will be observed that the

apparatus is free from complex mechanism, and that simplicity is the charm of the arrangement, for there is practically nothing to get out of order, and at any time all the parts are easy of adjustment. In the case of the maximum pressure, it is only necessary to regulate the overflow of the loading-tank to obtain what is required; and to change the point of loading, the raising or lowering of the water-supply vessel is sufficient.

It was with diffidence that we entered upon our first trial, as the dark days were still with us; but it was arranged, for safety, to experiment only during the day, unless the child of adoption should prove "wiser than the children of light," and put on the pressure before the usual time. We were not disappointed; the changer answering to the call a considerable time before the pressure would have been put on by the attendant. Diagram No. 1 shows the old and new system of loading; the dotted line denoting the loading by hand, and the full line by the automatic regulator. The diagram no doubt will be considered a good one; yet it will be observed that, although the governor commenced loading before the time appointed by hand, it was rather slow at taking on the pressure—due in a measure to the size of the governor being in excess of our requirements, which prevented that rise and fall of the bell which was desirable for satisfactory working. In these circumstances, it was decided to reduce the capacity of the valves to the capacity of the trunk mains, and at the same time to increase both the minimum and maximum pressures to 11-10ths and 25-10ths respectively. When this was done, the apparatus responded to the variation of supply more quickly.

Diagram No. 2 shows the changer at work on an ordinary winter's day, which is everything to be desired. There is no delay in the putting on of the pressure, and the maximum is fully maintained until 10.30 p.m., when the pressure is gradually reduced to the minimum, until 5.30 the following morning—the mills and workshops again asking for a maximum supply, which is given in a satisfactory manner.

Diagram No. 3 is for Sunday, and shows an increase of pressure from 11.30 a.m. to 12.30 p.m. due to the large demand for cooking purposes on that day. Although we have upwards of 40 gas-engines and other apparatus working throughout the week, our maximum day pressure does not equal the pressure required on Sunday morning. This no doubt is attributable to the fact that the mill operatives invariably have the best meal of the week on that day, and practically all the gas-stoves are in work at the same time—the number of stoves and grillers in use being 2422. This is equal to 53·66 per cent. of the total number of consumers; so that rather more than every second consumer has either a cooking-stove or a griller. Still following Diagram No. 3, the pressure does not arrive at the maximum until about 8 o'clock, which is the hour of closing the various places of worship. This would appear to indicate that further enlightenment is required after the people return home from their spiritual devotions. The difference in the time the maximum is maintained is most marked compared with Diagram No. 2.

Diagram No. 4 shows the action of the changer on Tuesday evening—being the tradesmen's half-holiday. At six o'clock, after the mills and workshops are closed, there is a reduction of 4-10ths pressure, and afterwards a gradual decline until the minimum is again reached. Diagram No. 5, which is for Saturday, also shows a diminution of maximum pressure, due to the mills and workshops closing at noon on that day. The pressure for early Sunday morning, it will be observed, is at the minimum, and shows the contrast between the morning pressure given on the other days of the week. This is a true indication that the people are resting from their labours. Diagram No. 6 shows the effect when sudden darkness appears, which in this case was between 10 and 11 in the morning; and the great advantage of the apparatus will at once be conceded under such circumstances.

I have selected the foregoing diagrams so that it will be seen how the demand varies in the ordinary working of a gas-works, and for special purposes also.

One of the most important factors in deciding upon the changer was the question of leakage; for there was every indication that it would be reduced. But as in the winter months the pressure was invariably put on earlier than it would have been by the attendant, there were certain misgivings on this point. The following statement from our published returns, however, gives the leakage as follows:—

1894	10·42 per cent.
1895	10·35 ,,
1896	8·54 ,,
1897	7·17 ,,
1898	6·86 ,,
1899	6·52 ,,

This statement shows a reduction in leakage of 3·9 per cent. during the period under consideration, equal to a saving of 4,627,000 cubic feet per annum on the gas manufactured at the present time. The result, therefore, shows that there need be no anxiety as regards increased leakage, but rather an assurance that the consumer obtains his supply of gas when he requires it, instead of waiting patiently for his illumination at the hands of the fickle attendant. I do not, however, claim that the above saving in leakage is entirely due to the adoption of the changer, as our sales of gas have increased considerably; but at the same time there has not been any extraordinary expenditure in reduction of leakage. I am fully aware that even now the leakage is considerably in excess of many towns; but, as already

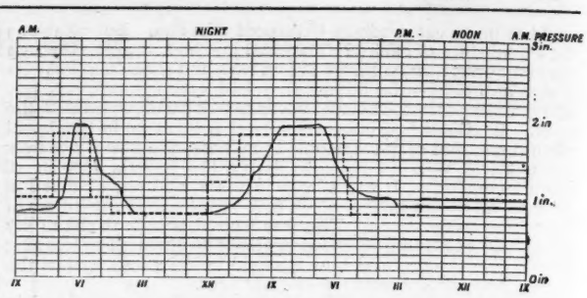


Diagram 1.

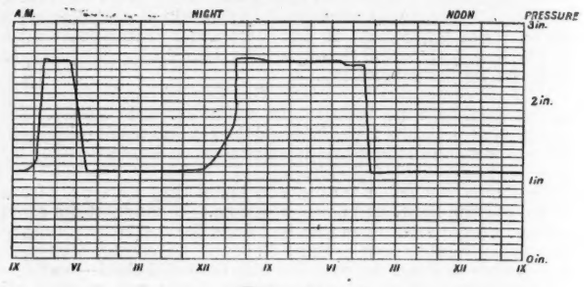


Diagram 2.

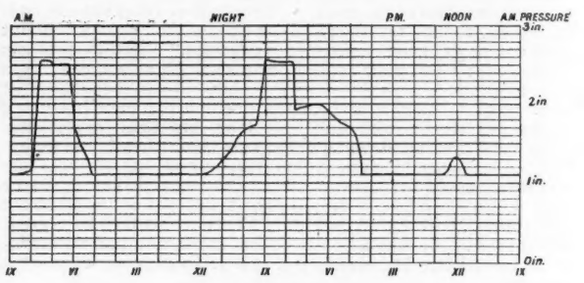


Diagram 3.

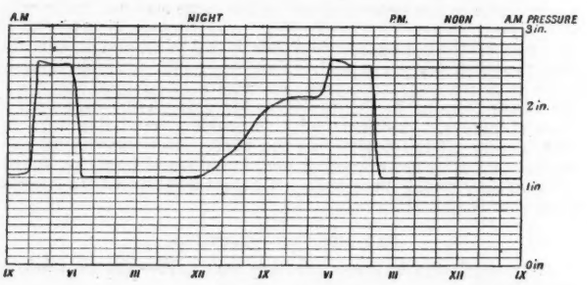


Diagram 4.

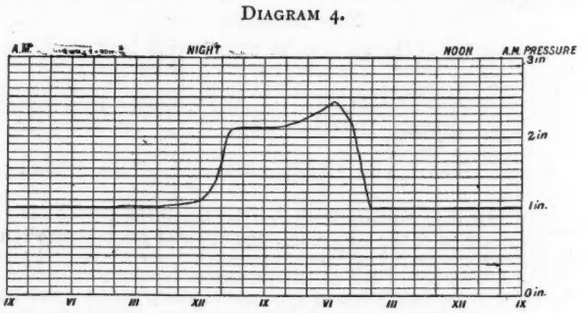


Diagram 5.

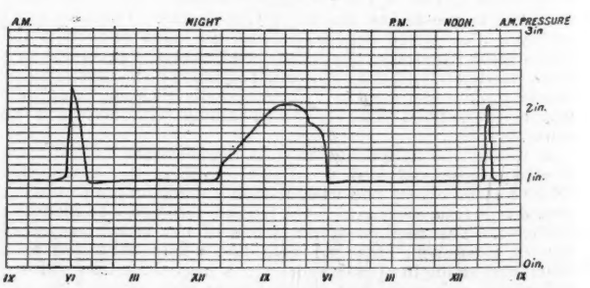


Diagram 6.

pointed out, the mileage of mains is large in proportion to the consumption.

It is important to bear in mind that there can be no satisfactory working where the mains are connected to other districts supplied by separate governors at different pressures. There must be complete isolation from the other districts of supply, or it is impossible for the apparatus to work satisfactorily. As previously explained, we have two governors; and the changer is only fixed to the town governor. But the two districts are merely separated by the insertion of a valve; and when this is open, the changer ceases to act, because the pressure in the other governor is always higher than the town governor.

It may be contended, however, that the governor ought not to be the medium for putting on its own pressure, and that circumstances may arise when, owing to distance and friction in the mains, the demands of the consumers will not meet with that response which is desired. I can only say that in practical working we have not experienced this difficulty. This is due no doubt in a large measure to our governor being placed at the lowest level in the district of supply, and the sudden rise of 30 feet in level from the works, which causes the governor to be much more sensitive than would be the case if fixed at a higher level. It may also be contended that, with self-loading, pressure will be given when volume only is required. For instance, supposing the valve has opened to a point at which self-loading begins, increased pressure may be given instead of increased volume. Following up the same principle, the effect would be, in loading the governor, that until the maximum pressure was attained there would be an excess of pressure instead of increased volume. This may be right in theory; but under our present system of supply, and so long as the carrying capacity of the mains is so inadequate to meet the demands without extra pressure, the principle does not apply in general working. With the self-loading governor, any demand in excess of the minimum pressure may be taken as an indication that the mains require pressure, and not volume, in order to obtain a satisfactory supply. But even if an excess of pressure be given, the only question affected would be the leakage; and the published returns already given are sufficient to assure the most sceptical on this point.

Of course, it is common knowledge that the self-loader has by some been considered an unreliable instrument; that the principles of working are wrong; and that the requirements of a district cannot be supplied in a satisfactory manner by the system. But the old adage is still true, that an "ounce of practice is worth a pound of theory." The practical satisfactory working of the self-loader during the past five years, is sufficient proof that under our conditions of working we could not do better; and in these circumstances, I am of opinion that the governor is the most satisfactory point for the controlling of pressure.

The advantages of the self-loading automatic pressure-changer may be summarized as follows:—

1.—It is thoroughly under control at the works.
2.—It is simple in its action—requiring no attention, and no cost to work it.
3.—The capital outlay is very small.
4.—The satisfactory working for five years has proved its utility.

In conclusion, I can only again call your attention to the diagrams to show you the great advantage of the automatic pressure-changer compared with hand loading, which we know, when carefully done, assures a fairly satisfactory supply. But the impossibility to decide beforehand the time at which to load by hand, the variation in consumption at different periods of the year, and this changeable climate of ours, render the automatic pressure-changer a desirable instrument to be adopted in the distribution of gas supply; and I feel persuaded, from the advantages enumerated, that the system will commend itself to the members of the Institution.

Discussion.

The PRESIDENT remarked that some of the members would no doubt have had experience of the arrangement described by Mr. Whatmough, or others of a kindred character.

Mr. PORTER said he had had some experience with a pressure-changer, but not in connection with a governor like the one described. Some four years ago, he had attempted to regulate the pressure as explained by Mr. Whatmough, on an existing 24-inch governor by Braddock; but he had had to abandon it. He must point out that the governor was not made with the view of attaching a pressure-changer to it; and perhaps this had a good deal to do with the failure. What were the advantages to be claimed for this pressure-changer? In the first place, he very much questioned the desirability of having a governor at all. He thought the subject of high *versus* low pressure gas supply had been brought up by the paper; and he must say, from experience he had recently had, that he very much favoured the former. This would, no doubt, come somewhat as a surprise to many of the members; but he believed he had a justification for it in the paper. Mr. Whatmough said they got reduced leakage; and he practically told them that, although this pressure-changer had put on the pressure much earlier than previously, when it was put on by an attendant, and the consumers had a higher pressure at their fittings during the 24 hours than they had hitherto had, the leakage was reduced. He (Mr. Porter) had had experience in connection with one company, who had a minimum pressure of 26-10ths and a maximum of 42-10ths; and although this company, turning out about 60 millions per annum, had worked under this high pressure, and given the consumers every satisfaction—as the gas had always been available at such a pressure that it could be used for any purpose all the 24 hours—their leakage was only about 8 per cent. Another company, sending out about 65 millions, had never less pressure on the mains than 36-10ths; and their leakage was under 10 per cent. Now there was no doubt that there must be a slight increase in the gas lost by leakage; but the advantages gained by the reduced size of mains, which overcame the difficulty of the consumers fittings being too small, must outweigh the drawback involved in the extra loss of gas. Therefore he did not think the advantages claimed for the pressure-changer were all that could be desired.

Mr. CHEW said he had for many years had an arrangement of the kind described; but perhaps the fact that he had not isolated the governor would have something to do with the results obtained, which were not such as had been given in the paper. The more important question, however, seemed to be that of high and low pressure. He had perhaps as little leakage as most people. It was not a hilly district, the greatest variation amounting to 30, 40, or 50 feet; but at the same time he believed a good pressure—that was to say, delivered to the consumer at not less than 15-10ths—would never cause a great increase of leakage. After midnight, when the consumption was very small, he dropped to 10-10ths; but afterwards it was never less than 15-10ths to 18-10ths during the day. He was inclined to think that he would do even better if he gave more, inasmuch as by an increase of pressure the detection of leakage was rendered a much more easy matter; the gas coming to the top much sooner. He had found this to be the case from long experience. During the last ten years, he had never had more than 3 per cent. of gas unaccounted for; and in the same period he had never had a lower pressure than 10-10ths during the small hours of the morning, and in the daytime 15-10ths to 25-10ths. Under these circumstances, although he did not agree with Mr. Porter that they should give enormous pressure, which would mean great waste in the consumption of gas at the burner on the part of the consumer, he thought they might give a reasonable amount of pressure, whether by some automatic arrangement or otherwise. He had tried one of the earliest types of automatic changers—the members had seen the governor that day. He had found that with those automatic regulators they really wanted a man to sit beside them to keep them right; and when the dark days came, he found he could not rely on the apparatus to give the required pressure. He was not disposed to go back to the method described. Again, he might say that a reasonable amount of pressure did not increase the leakage, if they paid careful attention to the meters, service-pipes, &c. They must keep the meters in proper order, and renew the service-pipes when necessary. He had adopted the plan of using lead pipes and covering them with tin to prevent honeycombing which sometimes took place. They must protect the gas mains and pipes from the action of the electric current escaping through the ground. Certain pipes belonging to the Water Company had been very severely honeycombed, which caused the water to escape freely. What took place in the water-pipes, would have to be guarded against in the gas-pipes. The difficulty in this direction was increased tenfold when they had electric mains all over the place. He had had practical experience of the effects of the escape of electricity on the pipes.

Mr. R. SHADBOLT (Fleetwood) said they had used the self-loading governor for somewhere about eighteen months at his works; and his experience was that it was a far superior governor to the hand-loading one. It was a very convenient arrangement. When he left Fleetwood that day, for instance, he had locked the place up, and ordered that no one should go in. The governor would automatically put the pressure on just when it was required, but not before. It was the same in taking the pressure off at night. As soon as gas was not wanted, and the consumption stopped, the pressure was taken off. By looking at the diagram they would see how faithfully it acted. He could quite understand circumstances arising, as in the cases mentioned by Mr. Chew and Mr. Porter, where the governor would be prevented from acting properly; but it was not fair to condemn the governor on this account. Owing to Mr. Porter adopting the system, he himself had been led to introduce it at Fleetwood; and he thought it was a most excellent apparatus. As to leakage, he could not say a great deal; but he did not suppose they lost much less gas than formerly—perhaps about 1 per cent. represented the difference. He, however, knew that they had, at any rate, a little more gas accounted for, and he considered this to be due to the action of the self-loader. Of the quantity of gas made, they had a little more—about 2 per cent.—sold. The self-loading governor was a step in the right direction; and with it they never experienced trouble through the man forgetting to turn the pressure off, as was often the case under the old arrangement.

Mr. A. GRAHAM (Mansfield) said that when at Hebden Bridge the two holders were 1½ miles each side of the works. The surplus gas used to go to the holders, from which it was taken back to the town, when enough gas was not being made at the works. The leakage, even under these conditions, was never

above 10 per cent. Twelve months ago, he was considering the question dealt with in the paper, and would have adopted the same system as that used by Mr. Whatmough; but, on inquiring into the matter, he found the mains must not be connected in the town. He therefore adopted two governors, on two 12-inch mains, but without the automatic water supply; and he was satisfied in every respect with the working. The water was turned on by a tap about an hour before the pressure was required, and turned off by the same means.

Mr. C. A. CRAVEN (Dewsbury) said he had had five or six years' experience with a pressure-changer, and had no trouble with it. They had not a tenth part of the bother about the pressure that they had previously experienced. The district was essentially a factory one; and at times it was not advisable to put the full pressure on. At such periods, they had just allowed the governor to put the pressure on to a certain point, as required. Then, again, if any repairs to the governor or loading apparatus were necessary, it was very easy to temporarily revert to the old method. The men liked the system very much. In their works they had the loading apparatus and the concentric tank, and had three divisions in it. They made their day pressure 9-10ths, which gave about 14-10ths in the lower part of the town; and they could make the maximum 18-10ths, or change it to 20-10ths, or, in the third chamber, to 23-10ths. He could corroborate Mr. Whatmough's summary of its advantages.

The PRESIDENT said the author might with advantage have given not only the pressure at the works, but also in the heart of the district. It would have helped the members to arrive at a right conclusion on the subject.

Mr. WHATMOUGH said very few people would agree with Mr. Porter that governors should be dispensed with. He thought the reason for the failure Mr. Porter had referred to in connection with the automatic changer was because his governor had such a large area, and was of an old-fashioned type, with the result that a great weight would be required, and loading would be very slow indeed, and consequently unsatisfactory. Mr. Porter seemed to think the advantages he had obtained were due to the fact that they worked at high pressure. As a matter of fact, the pressure was practically the same as before, except that it was put on a little earlier than by hand. The reason for Mr. Chew's governor failing was no doubt want of isolation. They must have it isolated, or it was of no use whatever. Mr. Chew said it was connected in other parts of the town; consequently the changer was thrown out of action, and could not possibly work. He also understood that Mr. Chew had had a man to put the pressure on. It appeared that he required special pressure at special times; and if this was so, of course the automatic regulation would be thrown out of action, even if there was complete isolation. He welcomed Mr. Shadbolt's testimony. Mr. Graham simply referred to the ordinary governor; he did not touch the question of the changer at all. There was no doubt the apparatus was very easy of adjustment. As to diagrams taken in the heart of the district, he did not quite follow the President's suggestion. Before they adopted the pressure-changer, their supply was satisfactory in the lowest parts of the town; and they only worked on the same principle now—the supply being given as it was wanted. He did not think a diagram taken in the district would have helped the members in the least. In conclusion, he might again say that he did not think they could do better than adopt the pressure-changer.

The PRESIDENT observed that Mr. Whatmough had scarcely understood his suggestion. Their practice was to put a portable register down in certain parts of the district, and see whether the pressure reached the point required.

Mr. W. CHEW then contributed the following paper:—

GAS TRACTION ON THE BLACKPOOL, LYTHAM, AND ST. ANNE'S TRAMS.

The desirability of using gas-engines as a means of driving tram-cars having in recent years attracted a good deal of attention from engineers generally, it has been thought a fitting opportunity for the members of the Institution to familiarize themselves with its application as in use at Blackpool.

The propulsion of gas tram-cars having been in daily use here since July, 1896, it is now lifted out of the experimental stage, due to its initiation, to that of general utility; and its capabilities can now be measured by actual working results. You, as gas engineers, are directly interested in its success, from two main causes—one is that in the event of their extensive application there is the prospect of a large demand for gas wherever installed; and the other (perhaps of still more importance) is the certainty that there will be a total freedom from the evils of electrolysis to your mains if gas-trams are adopted in lieu of the electric-trolly system, as now being erected in this country, the ravages from which are so well known in the United States, and even in this locality. It is with this twofold knowledge before you, that you are asked as gas engineers to examine the working details of the system which, if applied, is likely to be so beneficial to the industry, and at the same time relieve your anxiety with regard to the evils attending electrolysis of pipes on tram routes.

Without going into the history of the formation of the Company, but taking it as it exists to-day, we find the line connects the three towns along the high-road, by 7½ miles of single track, 4 ft. 8½ in. gauge, with loops where desired. The route is fairly level throughout, with the exception of the high railway bridges, which are crossed with a gradient of 1 in 25. There are in daily use fourteen cars, making 75 to 100 mile runs per day, as need be—more in the season, and less in the winter months. The total mileage this year will be 200,000 car-miles, as against 260,000 car-miles run by the Blackpool Corporation electric trams. This, I think, will give you some conception of the magnitude of the Company's operations.

Turning to the station and appliances, we find a car-shed, with cleaning pits, and a fine airy building of neat design, having suitable offices, workshops, stores, and compressing-rooms adjoining. The compressors occupy little space; each one being strap driven by 4-horse power nominal gas-engines. These take the gas direct from the town supply into the receivers, which are fine specimens of welded cylinders, and store the gas for use at 200 lbs. pressure per inch. All gas used is measured and checked to the engines, and for other uses, by separate meters belonging to the Company. The repairing shop contains all tools for such needy repairs as occur from time to time.

This, then, constitutes the whole of the apparatus (with the exception of a sub-station at the Lytham end, for charging purposes only), which is extremely simple throughout. The cars used are the double-decked type, mounted on four wheels, carrying 52 passengers inside and out, well upholstered inside, and in appearance outside equal to the best tram-cars of other makes. They are *minus* the fishing-rod appliance used on electric-trolly lines; while the absence in the streets of poles and wires is a decided improvement. The gas for the motive power is stored in three steel tubes under the carriage body, while the engine is snugly housed along one side; the working parts being easily accessible from the roadside. For cooling the engine, a condensing coil is placed on the top between the double deck. The engine is 15 brake horse power; and the feed is regulated to a constant quantity for the varying pressure of gas.

The stopping and starting is actuated from either end by the driver. There are at present only two motions arranged for—the one, called fast, being set to the limits of the Board of Trade regulations; and the other, called slow, for climbing the ascents before named. This prevents reckless driving, and is safer for the public. But there are times when, with a clear road, a higher speed might be used with advantage, as is done on the local electric trolly lines. This matter, I understand, will be remedied should gas traction be applied to light railways hereafter, as the public idea of success is measured only by speed attained.

Following a car from the depôt on its daily routine, it first takes up its charge of gas at about 140 lbs. pressure, which is sufficient for a run of 15 miles. Then, taking its position at the Blackpool end, it loads up with passengers and continues its journey to Lytham, picking up *en route*. Arriving there, it reloads and, passing the sub-station, either calls or passes on as needs be back to Blackpool. On passing the depôt, it replaces the quantity of gas used; the time occupied being 1¼ minutes only. And so on throughout the day. I must here say that a hose-pipe is connected with a main from the receiver, and is easily accessible to the driver in the centre of the track. He quickly opens the box-lid, couples the india-rubber tube (similar to a water-hose), turns the cock, and in the time named the car is off again. The engine is stopped only at each terminus; but for small stops on the way it is run continuously at light load. The effect of this is to give a not altogether unpleasant longitudinal oscillation to the cars, owing to their small wheel base. Whether or not it is advisable to alter this movement is an open question. The condensation of the waste exhaust—always a difficult matter—is well overcome in the newer pattern cars; these being larger and more airy throughout, while the earlier types are smaller and a little deficient in power in this respect. But these are matters on which you will be able to-day to form your own judgments.

Turning to the financial side of the Company, the nominal capital is £125,000. The Company having been reformed nearly a year ago, and not having yet issued their first balance-sheet, it would be presuming too much were I to anticipate their dividend for the first year; but the working statistics of all tram companies are based on the working expenses per car-mile, and if figures supplied by the Manager can be continued these will compare favourably with those of the electric trolly lines.

The result of two systems with similar mileage is given in the Technical Press for the undernamed towns as follows, for working expenses per car mile:—

Dover	7·00d. (trolly).
Blackpool	10·30 (conduit).
Gas-trams	5·16

The 5·16d. is the price at which the Tramway Company have contracted with the Gas Traction Syndicate to work their line, covering all working costs. Judged by this basis, gas traction holds a fair position. But as the figures may not all cover the same ground, I have adopted one referring to cost of power only. I find the electric trolly used ¾ to 1 unit per car-mile; and this is valued at different rates, according to whether the Company generate their own current or the electric-light depôt sell the current to them at a profit per unit. Taking two Companies of about similar mileage, the cost is—

Dover	3d. per car mile.
Blackpool	1¾ „ „
Gas-trams	1 „ „

Placed in this form, gas again holds its own, though if cost

price for each was charged, a further modification might be necessary.

In concluding my paper, I wish to thank the Tram Manager (Mr. Lewis Slattery) for his kindness in rendering me any information required. From the preceding figures it seems probable that the system may extend. If you can make it possible to get your various Boards to interest themselves in forwarding gas traction with only a fraction of the energy thrown into this class of work by Electric Light Committees desirous of finding a profitable output for their respective works, then I think I shall have accomplished the object of this paper.

There was no discussion on the paper.

Visit to the Gas-Compressing Station of the Tramway Company.

The members next paid a visit to the gas-compressing station of the Blackpool, Lytham, and St. Anne's Tramway Company, where they were received by Mr. Lewis Slattery, the Company's Manager, and Mr. Codlin, the representative of the British Gas Traction Company. The following particulars, in addition to those contained in Mr. Chew's paper, may be of interest: The rolling-stock of the Company consists of sixteen motor cars, four of them being 40-passenger cars, and twelve (of a newer type, with many improvements) to hold 52 passengers. The Company have this year carried with the same rolling-stock 220,000 passengers more than last year. Several improvements have been made to the line, parts of which have been doubled; the distance traversed being about seven miles. But the Company have power to extend the line at the Lytham end. At the compressing station, the gas from the Corporation supply comes through a main meter; and the portion to be compressed passes to two compressors driven by a Crossley engine—a spare engine being also provided. Subsidiary meters record the quantity of gas used by the compressors and gas-engine; separate meters for each being fixed. After compression, the gas is forced into the holders, and taken thence through a pipe to the cars in the centre of the passing-place, where the cars are charged.

After the inspection, the party returned to the Palatine Hotel, where tea was served. Before the members separated, a vote of thanks was accorded, on the motion of Mr. H. Townsend (Wakefield), seconded by Mr. J. Wilkinson (Drighlington), to the Tramway Company for allowing them to visit the station.

Drought and Steam-Boilers.—Attention is called in "The Builder" to a source of danger, not commonly recognized, which is apt to arise with steam-boilers during drought—the danger, namely, of explosion should the feed-water be drawn from disused wells or muddy ponds. The immediate cause of such a mishap is the over-heating of the furnace plate (or of the tubes in a multitubular boiler) due to the formation thereon of a saline or muddy "scale." This scale, being partly detached from the plate, forms an annular space which, becoming filled with superheated steam, prevents the proper conduction of heat from the fire. As a result, the plate grows red hot locally, and bulges, until at last an explosion takes place. It is very much to be desired that all persons having the control of boilers should know the possibly serious consequence of a thin and recently-formed deposit on the plates.

A New Insulating Material, known as iron elt, is made at the Aldershof Works, near Berlin. According to the "Manufacturer," it consists essentially of long and strong woollen fibres, impregnated with a bye-product of petroleum, and then coated (with a certain amount of penetration) by a gelatine rendered insoluble, and also, alternatively or in addition, with india-rubber, afterwards vulcanized. After being subjected to considerable pressure, the iron felt assumes the form of plates, measuring 20 square centimetres and upwards, with a thickness varying from 1 to 5 centimetres. These plates are very elastic, and are practically imperishable; while they will stand a pressure of 1158 kilos. per square centimetre (20,736 lbs. per square inch), and their surface is so hard that it cannot be cut by the sharp edges of bolt-heads or of iron girders. Placed under plummer-blocks, or between engines and their foundations, this material, it is claimed, will prevent vibration.

The Velocity of Detonation of Acetylene.—At a recent meeting of the Paris Academy of Sciences, MM. Berthelot and Le Chatelier presented a communication on the above subject. Acetylene was detonated in a glass tube by caps of mercury fulminate or chlorate powder; care being taken to have the detonator as small as possible, as it was found that irregularities were introduced if it was too violent. The acetylene was contained in horizontal glass tubes, under pressures varying from 5 to 36 atmospheres; and the velocity was registered photographically upon a falling sensitized plate—the light emitted by the explosion itself being sufficient for the purpose. As the flame moved farther from the source of explosion, the velocity continually increased; the tube generally breaking before the speed became uniform. Even when the conditions of inflammation and pressure were apparently precisely identical in two succeeding experiments, discordant results were sometimes obtained for the increase of velocity of the flame along the tube. The results show that the propagation of the detonation of acetylene is produced with a velocity which increases with the pressure from 1000 metres per second at 5 atmospheres pressure to 1600 metres per second at 30 atmospheres.

PARTIAL COMBUSTION OF COAL FOR THE PRODUCTION OF FUEL GAS.

To the scheme of coal distillation and gas and fuel production in bulk which Mr. George Beilby sketched in his presidential address to the Society of Chemical Industry, and which was noticed last week, he added the following references to fuel gas processes, in order to complete his picture of the fuel manufactory of the future.

There are two leading types of gas-producer—the continuous and the intermittent. The former aims at the continuous production of a gas of a uniform quality. This is accomplished by burning the fuel in a limited supply of air, or in a mixture of air and steam. In the working of the second type of producer, there are two alternate phases in the operation—viz., a heat-producing and storing phase, during which air alone is forced through the mass of fuel so as to generate heat rapidly, which heat is accumulated in the mass of fuel in readiness for the second or gas-producing stage, during which steam alone is forced through the highly-heated fuel, and is decomposed, yielding hydrogen and carbonic oxide.

The first type produces a gas containing a large percentage of nitrogen and a correspondingly small percentage of combustible gases; the second type produces a gas rich in combustible gases, and containing only a small percentage of nitrogen. An average gas of this type has a heating value of 350 to 370 British thermal units per cubic foot, while gas of the first type has a heating value of 130 to 160 British thermal units per cubic foot. The relative efficiency of these methods, from a thermal point of view, varies from 60 per cent. to 80 per cent. That is to say, if the heat value of the coal by direct combustion is taken as 100, these several forms of gas-producers give an available yield of gas fuel having a heating value of from 60 to 80. The efficiency of the second or intermittent type of producer depends to a very large extent on the means available for recovering the heat which passes away with the gas generated during the first or blowing-up stage of the operation. Owing to the great depth of fuel through which the blast has to pass in these producers—often as much as 8 to 10 feet—a considerable amount of the carbonic acid produced at the bottom of the column is reduced to carbonic oxide before the blast gas leaves the top. Unless means are available for the utilization of this low-grade gas for steam-raising or otherwise, there is a considerable loss of the heat value of the coal. Dellwik has proposed to work with a comparatively shallow bed of fuel, which is more quickly raised to incandescence by the blast, while the reduction of carbonic acid to carbonic oxide is almost entirely avoided. By this means, it is said that the consumption of fuel in blowing up is much reduced, while a greater amount of water gas is produced. The thermal efficiency of the intermittent producer worked on this principle is said to be 70 per cent. If these results are confirmed by a lengthened working experience, there ought to be a great future for the system.

In 1881, while engaged with Mr. William Young in developing our system of retorting oil shales, it occurred to us that the process we had evolved for that purpose ought to have a much wider field for development in the treatment of coal for the production of fuel gas and ammonia. Following our usual practice, we each set to work to realize our ideas in our own way. In September, 1883, I had the honour of laying the result of two years' experimenting in this matter before the Mining Institute of Scotland, and in the following April the general results of some ten or twelve years' work on the nitrogen of bituminous minerals were laid before the Scottish Section of our own Society.* The paper read before the Mining Institute described certain experiments on a working scale which had been going on at Oakbank Works for two years on the gasification of coal in excess of steam alone or mixed with air. It also entered into the theoretical side of the thermal reactions involved in the process; and finally I permitted myself to indulge in certain sanguine forecasts of the far-reaching effects which would flow from the use of the process. The experiments showed that it was commercially possible to oxidize coal with a mixture of steam and air, to recover 90 to 120 lbs. of sulphate of ammonia per ton, and to produce a fuel gas of which the following is an analysis:—

	Per Cent.
CO_2	16·6
CO	8·1
CH_4	2·3
H	28·6
N	44·4
	100·0

The thermal value of this gas is about 150 British thermal units per cubic foot. The calculations showed that, with proper recuperative arrangements, a thermal efficiency of over 80 per cent. might be reached by this process. The unit plant at work was a small one, only capable of dealing with a few tons of coal per day. The increase of the retorting or gasifying plant, however, presented no difficulties; the real barrier to progress was the enormous volume of gas which had to be cooled and scrubbed efficiently and economically. It must be remembered that at that time the problem of dealing with 170,000 cubic feet

* See "Journal," Vol. XLII., pp. 789, 927.

of gas per ton of coal was practically a new one. Messrs. Alexander and M'Cosh were just working out the recovery of tar and ammonia from the gases of the blast-furnace; and their plant was on its trial. In no other industry had any serious attempt been made to deal with such enormous volumes of gas as were involved in the gasification of the whole of the carbon in the coal. While we were considering ways and means by which this large volume of gas might be economically cooled and scrubbed, the price of sulphate of ammonia began to fall, and very soon reached a point at which the profits of our process, depending, as they did, so very much on the value of the ammonia recovered, began to appear problematical. Meanwhile the extensive adoption of our shale-retorting system, and the patent litigation to which it gave rise, absorbed so much energy and attention that the fuel gas process was allowed to lie dormant till better times should arrive.

My distinguished predecessor, Dr. Ludwig Mond, in his address at the London meeting of 1889, unfolded before the Society the successive steps by which he had developed this same process. But he was able to go farther than we had gone. He had not stopped short of the construction of a complete plant fully equipped at every point for the burning of coal in excess of steam and air, and fully equipped also for the economical scrubbing and handling of the great volume of gas produced by the process. This work will be always regarded by those who are familiar with it as a monumental illustration of what is meant by chemical engineering in its proper sense. The gospel of cheap and plentiful ammonia and smokeless fuel, which it had been my privilege to announce to the Mining Institute of Scotland in 1883, was again sounded forth with the added weight of years and achievement by Dr. Mond in 1899; but I regret to say that it has not as yet met with any general acceptance. To those of us who are intimately acquainted with the process and the gas it can produce, it is surprising to find how very slowly it has made its way in the industrial world. This may partly be explained by the reluctance of the British manufacturer to take up a complicated operation, however perfect it may be, if by any chance he can find anything simpler which will do only half as well.

I think we must now take it for granted that the best way to extend the use of fuel gas will be by the formation of fuel-gas centres in suitable localities. If such centres were in a position to distribute not only fuel gas but also light and power at a moderate cost, and without the pollution of the air and general surroundings, one cannot help feeling that industry of all kinds would be drawn towards such desirable localities. Industrial cities of an ideal character would be created; for into such desirable surroundings it would be natural that the best skilled labour should tend to gather—surroundings where the conditions of life would be clean and bright, instead of gloomy and squalid.

Since writing the foregoing, it has been my privilege to visit the works of Messrs. Brunner, Mond, and Co., at Northwich, and to see the complete installation of Mond producers there at work. My knowledge of the process and of its special points of difficulty enabled me to appreciate the great skill and courage which must have been devoted to its development in this plant—the skill in meeting the practical difficulties with which the problem bristled, and the courage and breadth of mind with which so huge an undertaking has been grasped in its true proportions. From the careful selection of the most suitable slack, by a series of ingenious laboratory tests, to the final distribution of the fuel gas under uniform pressure over the extensive area covered by the works, the whole system is perfect and complete. Carefully devised checks and controls are to be found at every point; and the result is that an intelligent technical manager is able to keep his hand on the process under all conditions.

After seeing this plant at work, I was naturally led to further consider the question, Why has this process of gas production met with so little acceptance in the world of industry, chemical and metallurgical? The answer to this question appears to be at least threefold. In the first place, the process is a delicate one, and the plant is complicated. It requires, therefore, to be superintended by a well-trained technical man, who can be depended upon to devote steady attention to keeping the whole system "on the rails." A little carelessness or neglect might go a long way towards converting a safe and excellent process into a dangerous and extravagant one. In the second place, the first cost of the plant is so comparatively high that no one would care to take up the process except as an adjunct to some large manufacture of a very permanent character. In the third place, the price of ammonia, the bye-product on which the commercial success of the process absolutely depends, has been subject to such violent fluctuations that manufacturers have naturally felt timid about incurring a heavy plant expenditure for the production of so fickle a commodity. The last reason has already been dealt with in considering generally the effect of a largely increased production of sulphate ammonia on the market outlets and price. I simply repeat what was then said—I feel confident that such an increased production will tend to the establishment of a freer market, and a steady, if moderate, price. With regard to the two other portions of the answer, these seem to lead up naturally to the policy of establishing fuel-gas centres where the whole attention of the staff would be directed to the production and distribution of fuel gas to works in the neighbourhood. Whatever may be thought of schemes which involve the conveyance of fuel gas for really long distances, measured by tens of miles, there can be no doubt whatever that its economical conveyance to works within a mile or two of the producers is perfectly feasible. With a steady supply of the gas always available in the works' mains, its value for furnaces of all kinds would soon become recognized and appreciated.

At the Engineering Conference recently held in London, some doubts appeared to exist in the minds of those who took part in the discussion of Mr. William Foulis's paper as to the real value of this particular fuel gas.* These doubts may be set at rest in two ways: In the first place, a careful study of its composition will show that the high percentage of carbonic acid is more than compensated for by the high percentage of hydrogen. The result of this is to increase the temperature of combustion to a point very considerably above that of ordinary producer gas. In the second place, the results of practical experience fully confirm these theoretical conclusions. For a number of years I used a similar gas (the analysis of which has been given above) for the heating of a bench of shale-distilling retorts of the Young and Beilby type, in which a temperature of 2000° Fahr. was easily maintained in the lower ovens, by the burning of the cold gas mixed with cold air. It would have been quite easy to preheat the gas and air if that had been necessary; but the temperature obtained without pre-heating was quite satisfactory. The extensive experience of Messrs. Brunner, Mond, and Co. in the use of this gas in their furnaces is of itself a sufficient guarantee of its suitability and value for all such purposes as those referred to.

Though not strictly in place, I may refer here to the use of Mond gas in gas-engines. The experience at Northwich has been conclusive as to the economy and efficiency of this method of power production. A large gas-engine of over 300 horse power has been run continuously for a period of 139 days; the gas being measured into it through a meter, the power being taken off as electric current, which was also carefully measured. The coal consumption, taking the full proportion charged into the gas-producers, worked out to something less than 1 lb. of coal per horse-power per hour as delivered by the engine to the dynamo. Messrs. Brunner, Mond, and Co. are preparing to follow this matter up by putting down two gas-engines of 500-horse power each. It is evident that power produced in this way will rival in cheapness the best water-power installations, with the advantage that it can be obtained in localities which are conveniently placed for the transport of raw materials and products. It is rather a striking thought that the 5 million horse power which is at present developed by steam-boilers, with a consumption of 50 million tons of coal, might be developed by Mond producers and gas-engines with a consumption of only 10 million tons!

In the Mond producer, I think we have found the means of completing our picture of the smokeless fuel factory of the future. With this addition, the factory would be in a position to supply smokeless fuel for every purpose, whether domestic or industrial, while its internal economy might be practically perfect.

The Evolution and Future of the Gas-Engine.—In an interesting essay contributed to the "Engineering Magazine" on the "Evolution and Future of the Gas-Engine," Herr Georg Lieckfeld remarks on the curious delay that occurred in the practical adaptation of the power of gas explosions to the driving of a motor-engine. He gives to William Barnett, whose patent specification is dated 1838, the priority for claiming the broad principles which still govern explosive gas-engines. Although Barnett's specification did not describe a practical working engine, according to modern lights, nevertheless his ideas included all that is fundamental in the theory of the modern gas-engine. These points include compression of the mixture constituting the charge before ignition, combustion in the working cylinder, dilution of the mixture with combustion products, and ignition on a dead centre. The first really successful gas-engine was Lenoir's, made about 1860. It had the defect of requiring a heavy consumption of gas. It was practically a double-acting engine without compression. Next came the flying piston engine of Otto and Langen; but it was still many years before N. A. Otto realized the compression gas-engine. Lieckfeld gives Otto the credit for the design of the four-stroke compression gas-engine. Not uncommonly in the history of invention, the Otto patents were sustained at law on several points which experience has shown to be unessential. Lieckfeld thinks that gas-engines of large size and great power are certain to take their place among the standard motors of the future, when there are as competent engineers for this work as there are for the much older branch of steam engineering. Steam-engines have been perhaps perfected to the utmost limit; but this is not yet the case with gas-engines. It has been proved to be possible to increase compression in the explosion type of engines to an even greater maximum than the Z atmospheres, without running any risk whatever of premature ignition; but explosion engines are perhaps less susceptible of improvement than the so-called combustion engines of either the Brünter or the Diesel type.

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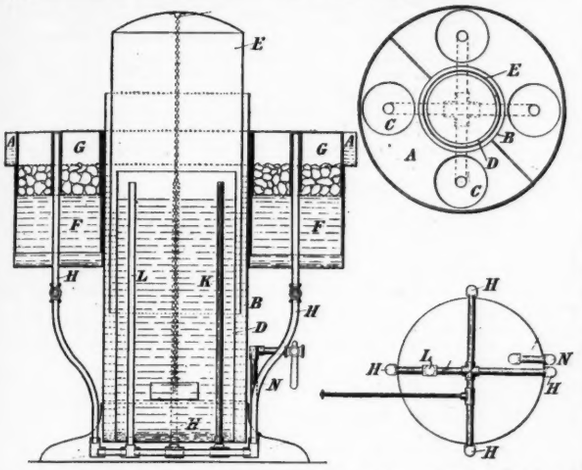
* See "JOURNAL," Vol. LXXIII., pp. 1554, 1565, 1652, 1751.

REGISTER OF PATENTS.

Acetylene Generator.—Goodwin, J. S., of Stamford Hill, N. No. 19,149; Sept. 8, 1898.

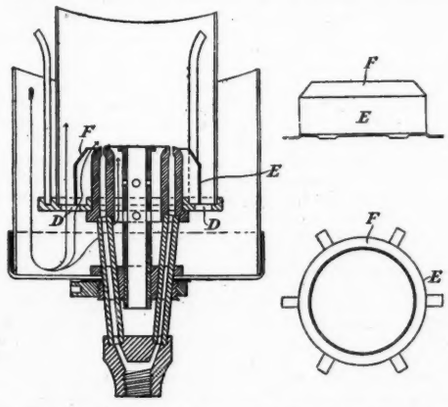
This generator (a cross section of which is shown) consists of a large tray A carrying a central reservoir B and four metallic cylinders or wells C formed integrally with it. The reservoir contains a cylinder D covered by a gasholder E, capable of moving in the usual manner between the casings B and D, and provided at the top with a ring to which is secured a vertical chain, to the other end of which is attached a weight. Each cylinder or well C contains a water-reservoir F, open at the bottom, and a carbide receptacle G furnished with a perforated bottom or sieve, and with lateral perforations. A central vertical pipe H extends upwardly throughout the well, reservoir, &c., right up to the top of the tray A; while below the well the pipe is connected to a horizontal cross-pipe, to which is attached an upright eccentric inlet-pipe L, which extends through the bottom of B to nearly the top of the cylinder D. Another vertical, but eccentric, outlet-pipe K, forming a pendant to the pipe L, passes through the bottom of the reservoir, and is connected to a short pipe to which is also jointed the acetylene gas-supply pipe N.



The holder is shown in its uppermost position, wherein, under the pressure of acetylene, the bell has raised the weight on the chain, while the pressure in the reservoir F has caused the water to descend and occupy the level shown, when the evolution of acetylene practically ceases—the bell affording ample accommodation for any after formation of acetylene from the still damp carbide. As the acetylene is being withdrawn for consumption, the holder descends, and the weight drops on the bottom of B. Thereupon the water in the reservoir F ascends, and comes again into contact with the carbide in G, when gas is evolved.

Gas-Burners.—Stent, W. K., of Queen Victoria Street, E.C. No. 19,398; Sept. 12, 1898.

This invention relates to burners of the argand type, "in which heated air is introduced to the gas at the point of combustion, to effect maximum incandescence of the resulting flame;" and it consists of improvements "whereby a portion of such heated air-current is directed as a protecting and scouring envelope around the internal periphery of the inside chimney,



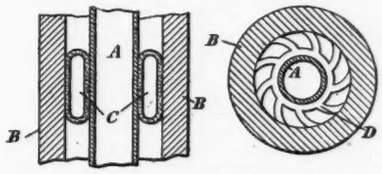
thus preventing the direct impingement of the flame thereon, and the gradual deposit upon it of discolouring matter, which effect has been found to be a great drawback to such burners adapted as heretofore to burn gas at its point of maximum incandescence."

To carry his "invention" into effect, the patentee finds it necessary that a considerable portion of heated air shall, as heretofore, be allowed to impinge directly upon the gas-jets at the point of combustion, "in order to still maintain high incandescence;" but at the same time he splits the ascending stream of hot air by a cone, so adapted to the grid-like opening upon which it rests, that a portion—say about one-third—of the total hot current is directed vertically upwards "as a scouring envelope about the internal periphery of the inner chimney, and thus between the chimney and the flame."

The burner shown is of the usual argand type, with small exits for a series of gas-jets surrounding it. There is an inner chimney and an outer chimney, between which passes a supply of air to the underside of the burner. This heated air is in major part permitted to pass through a grated support D of the inner chimney to the outer part of the flame. The obscuration of the inner chimney, according to the patentee, is caused by "the inductive attraction of the upward hot-air current to the gas-jets issuing at a high velocity from the burner causing an eddy or slackness of air-current against the internal surface of the inner chimney." He therefore applies an air-current dividing-device E, resting upon the support D, and dividing the upward current into three parts. The inner part (about two-thirds of the volume) still impinges on the gas-jets (both inside and outside) at their point of issue, and is the more induced to do so by the upper lip F of the dividing-device being bent inwards towards the flame. The outer portion of the ascending hot-air current is guided by the ring E, so as to travel vertically upwards, "sweeping the internal surface of the inner chimney; thus preventing the deposit thereon, and, by its high temperature, completely consuming any smoke or unconsumed particles of carbon that would otherwise remain there as coloured deposit."

Incandescence Lamps.—Imray, O.; a communication from J. Moeller, of Palmer Street, Westminster. No. 19,779; Sept. 17, 1898.

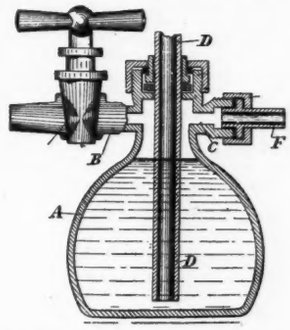
This is an appliance to prevent the communication of vibration from the lamp-post to the gas-pipe supplying an incandescent burner.



As shown, the gas-pipe A is surrounded by a soft elastic buffer interposed between it and the interior of the lamp-post B. This buffer may be a hollow ring of caoutchouc C slightly inflated, or (as shown in the plan) a ring of caoutchouc D having spokes projecting from it, and bearing with some slight pressure against the interior surface of the lamp-post.

Testing the Soundness of Gas-Fittings.—Frankl, O., of Vincent Street, Westminster. No. 21,493; Oct. 12, 1898.

Apparatus constructed according to this invention for testing ordinary illuminating gas-pipes, comprises a liquid reservoir or chamber A (having an inlet-pipe B and an outlet-pipe C), partially filled with a liquid. A displacement tube D is fitted, by means of a gland and stuffing-box, with screw cover, in the chamber A, so that the lower end dips below the liquid. The inlet-pipe is fitted with, or attached to, means to admit air under pressure or other gas through it; and the outlet-pipe is fitted with a union joint or other inlet for air-tightly connecting it to the pipe or tube F to be tested, and which is temporarily closed at its outer end.



When the apparatus is connected up, air under pressure is forced to the interior of A; and its pressure displaces the liquid, and causes it to rise in the tube D. The valve on the inlet-tube pipe is then shut off; and any leakage in F will be indicated by a fall of the liquid in the tube D.

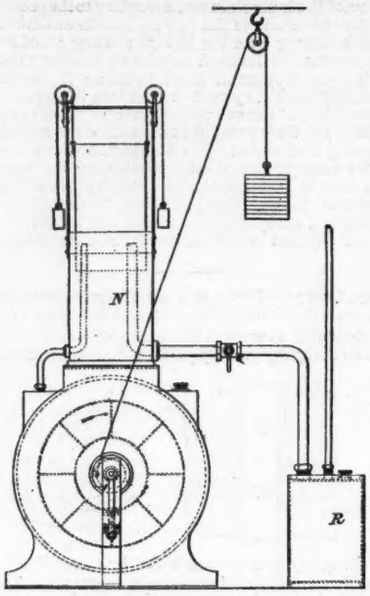
The apparatus is adapted for testing a domestic service of gas or water, as well as for testing single pipes or a series of pipes. If it should be required to test (say) the gas-pipes in a building, it is only necessary to shut off all the supply-cocks and connect some part of the supply-pipe to the outlet-pipe C of the apparatus. The operation is then as before described, except that the compressed air acts first upon the illuminating gas in the pipes and compresses it; and when equilibrium is established between the pressure of the gas in the pipes and the compressed air admitted to the chamber A, the water will rise in the tube D.

Manufacture of Combustible Gas.—Böhndel, H. H., of Hamburg, and Yeaton, C. C., of Lombard Street, London. No. 3290; Feb. 14, 1899.

This invention (which is supplementary to the one described in the "JOURNAL" for the 29th ult., p. 541) relates to apparatus for the production of combustible gas for illuminating and other purposes, by passing a steady blast of air through a sealed receptacle containing calcined kieselghur or infusorial silica impregnated with hydrocarbon—such, for instance, as naphtha or benzene. It has for its object "the production of such gas efficiently and economically," by using air-compressing apparatus consisting of an outer fixed casing and an internal rotary drum, having a closed compartment at one end and a number of helical channels or passages connecting the compartment with the opposite end of the drum, whereby air is taken in at atmospheric pressure and discharged at a higher pressure.

As will be seen from the engraving [p. 652], the patentees use a well known type of plant, consisting of a horizontal rotary drum with a number of helical channels or passages formed round a central axis, and

connecting a chamber at one end of the drum (which is closed) with the opposite end of the plant (which is open). There is a pipe fixed to the casing and entering the chamber which admits atmospheric air to it



above the level of the liquid. There is also a ratchet-wheel fixed on the projecting end of the rotary drum spindle, with a winding drum mounted loosely upon it, provided with a pawl, which engages with the ratchet-wheel. A cord is wound upon the drum, the free end of which, after passing over an overhead pulley, has a weight attached to it. A handle fixed to a square-ended spindle on the outer end of the winding drum is for the purpose of re-winding the drum when it is required to raise the weight. N is a reservoir for the compressed air, which is connected by pipes and taps to a sealed carburetter R, which contains the calcined kieselghur impregnated with hydrocarbon.

Gas-Burners.—Potter, W. G., of Birmingham. No. 11,491; June 2, 1899.

In this arrangement of burner, there is a nose-piece at the base with a tube to connect it to the gallery. Inside the tube is a gas-box; and to the box is fixed a vertical inner tube. To the gallery is fixed a vertical outer tube, provided with a stop-piece at the apex. About half way from the top of the outer tube is a perforated spreader. On the top of the gallery is a circular ring with a perforated base; and to the gallery is screwed an outer ring which, with the other ring, forms the burner. Beneath the gallery are cross-tubes for the supply of gas to the burner. The outer part of the burner (attached to the hollow spreader) is lined with lava; and the float-valve of the regulator opens and closes according to the pressure of gas in the main. At the base of the burner the gas passes up from the regulator supply to the top of the hollow spreader and returns back down the outer side of the inner tube, superheating the gas, and so increasing the illuminating power.

Acetylene Generator.—Goldbacher, J. N., of New York, and Bournonville, E., of New Jersey, U.S.A. No. 13,301; June 27, 1899.

This apparatus for producing acetylene consists of a generator-tank containing water; a gasholder receiving the gas from the tank; means operable from the holder for feeding charges of the carbide to the tank; and an outlet-pipe for the gas from the holder. The specific claims for novelty pertain more particularly to novel automatic means for feeding the charges of carbide to the generator-tank; to means intermediate between the gasholder and the feed wheel, whereby the latter, at the proper time and to the proper extent, is actuated by the movement of the holder; also to novel features pertaining to the generator-tank, and means for controlling and delivering the gas from the generator-tank to the holder, whereby the attendant may withdraw the water and deposits from the tank without interfering with the use of the apparatus.

APPLICATIONS FOR LETTERS PATENT.

17,361.—Broadhead, J. W., "Regenerator settings." Aug. 28.
17,376.—Lee-Giles, G. F., "Acetylene gas purifiers." Aug. 28.
17,396.—Schnitzler, C., "Generating acetylene." Aug. 28.
17,406.—Matthews, F., "Acetylene gas-machines." Aug. 28.
17,408.—Klein, M., "Breaking-up or reducing coals." Aug. 28.
17,429.—Defontaine, W., "Heating apparatus for gas." Aug. 28.
17,476.—Godshalk, E. H., "Gas-engines." Aug. 29.
17,478.—Pace, A. G., "Gas-engines." Aug. 29.
17,493.—Clarke, E. L., "Gas-engines." Aug. 29.
17,512.—Hårdén, J., "Gas-motors." Aug. 29.
17,617.—Walker, W., "Exhausters." Aug. 31.
17,620.—Young, W., and Glover, S. & T., "Scrubbing and washing gases." Aug. 31.
17,631.—Richard, C. B., and Cahen, F., "Generation of acetylene." Aug. 31.
17,654.—Thwaite, B. H., and Mensforth, H., "Internal combustion engines." Aug. 31.
17,724.—Dutton, E. K. & E. L., "Gas-motors." Sept. 2.
17,726.—Bellamy, A. R., "Gas-motors." Sept. 2.
17,765.—Danchot, A. P. E., and Saulay, L. M., "Acetylene gas-generator." Sept. 2.
17,773.—Rutter, J. R., and Sueur, F. H. le, "The portable safety gas-generator." Sept. 2.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Hastings Carburation Process.

Sir,—I regret that, even now, Mr. Young is unable to admit the facts in regard to the above; and I therefore will not trespass upon your space beyond replying briefly, for the information of those of your readers interested, to one or two of the statements made by him.

I repeat most emphatically that the carburetted water gas has not anything to do with the success of the carburation process, which is now in use, or being installed, at home and abroad, in works making coal gas only, and *coal gas with water gas*. Thus independent testimony as to the process in these works will, no doubt, in due time be forthcoming.

Mr. Young has not, like other of my critics, honoured us with a visit; and his conclusions are mainly based on premises which have no foundation in actual fact. Thus, 33⅓ per cent. is our ordinary maximum requirement for water gas; but, of course, we do not regularly make up to this quantity, and it is most desirable to point out that in 1897 (the second complete year of the carburation process) the water gas made represented only 8 *per cent. of the total quantity*, and in 1898 (last year) the water gas was under 17 per cent. of our total make.

It is, of course, true that mixing water gas with coal gas for distribution reduces the total amount of naphthalene which can possibly be deposited; but there are contrary influences at work which evidently render the dilution practically of no consequence. In the carburation process, an essential condition is that the gas, after carburation, should possess the oiliness, as detected by the "slate test," often referred to. This oiliness, permanent carburetted water gas does not possess; and for a long time past the mixing-main of the coal and water gas on these works has been free from any deposit of oil. This I thought I made quite clear in the paper on "Carburetted Water Gas" to which Mr. Young has referred, as the original conditions of manufacture have been entirely altered. The reasons for the larger quantity of oil used in 1896—the first year of the process—are very simple. There were in the canalization deposits of naphthalene which had to be dispersed; and enriching oils, used experimentally, formed a large proportion of the total quantity.

Is it not rather curious that Mr. Young should take so much trouble to disprove my comments on what was an obvious slip on the part of the writer of the article *re* the Dessau experiments?

In conclusion, I should like to draw attention to an experience of the present time, which is a fact. It is this: The coal-gas manufacturing plant at Hastings has for the last ten years at least been free from deposits of naphthalene; but in the past two years the plant which is used for both coal and water gas—namely, three catch purifiers and a large gasholder—has been partly blocked with naphthalene. At the time of writing, the inlet of the holder is nearly made up with naphthalene; and this is the holder into which *carburetted water gas* is constantly going. This might have been attributed to the exceedingly hot summer, but for the fact that, as I say, for the past two years we have noticed a tendency for naphthalene to form; and as the same plant was formerly used for coal gas only, without anything of the sort, the conclusion to be drawn from the experience is an obvious one.

Chas. F. Botley.

Hastings, Sept. 8, 1899.

The Consumption of Water per Head in Different Towns.

Sir,—The interesting paper on the above subject, by "A Distributing Engineer," covers a great amount of ground, and gives water engineers an opportunity to discuss the various causes which govern the consumption—or as some prefer to call it, waste—of water in towns. Only pressure of business has prevented me from confirming what has been stated by "A Distributing Engineer." The term "consumption per head" is somewhat losing its significance to-day among practical men. We are told what is, and what ought to be, the consumption per head in various towns, and what saving has been made therein by waste-water meters, better fittings, and even systematic inspection; but a uniform standard for the consumption of water per head in the towns and villages of Great Britain is not yet within the region of "practical politics."

I am afraid that I have not had the experience of "A Distributing Engineer;" but many years ago it occurred to me to ask about half-a-dozen friends residing in as many different towns to note the amount of water used in the preparation of food in their respective families. From time to time this has been added to, with the result that in one town ½ gallon per head sufficed, while another family in a similar house used three times this quantity. When a variation takes place in such a simple matter as culinary requirements, we cannot wonder at similar variations in the total needs of even neighbouring towns whose habits, positions, and tastes are to the casual observer precisely similar, but are easily explained when you get "in the know." Within the last month I wandered into two neighbouring towns on the south coast, within a score of miles of each other. One of these gives its consumption of water at 21 gallons per head, the other being among the 30's; and to an ordinary observer, the water engineer of one town was doing his work on two-thirds of the means of the other—the chief difference being that one adopted the waste meter, and so saved at least 10 gallons per head per day. While the waste-water meter undoubtedly assists in detecting waste, there were other reasons for this great difference of consumption not so apparent. For instance, the streets in the economical town were watered by unfiltered water, which I was informed was not reckoned in the quantity supplied; garden watering was prohibited in one town, while the other seemed alive at night with garden hose and "spinners;" and even in the short stay I had in each one I saw that the quality of the visitors, and probably the quantity also, was higher proportionately in one than in the other. Further, both were supposed to have constant supply; but in the town of lower consumption I was assured that in some districts at least it was a misnomer. The supply was one of three or four hours per day, and the storage cisterns did the rest—consumers being careful not to waste the water, where no more was to be obtained from the mains until next day.

My first acquaintance with water distribution was in a town north of the

Tweed, where the so-called "thrifty Scot" was using what was to English eyes an extremely prodigal quantity of water. The growth of the town brought the water authorities face to face with the need of a new supply at a great expense, which might be avoided for some time could the enormous consumption be reduced. An English engineer, then at the head of his profession, was called in, and advised that a second engineer should be consulted in the matter of reducing waste. Since then waste-water meters have been fixed, and other improved apparatus introduced; but the quantity consumed per head is practically the same as it was twenty-five years ago, and even the new supply has failed to satisfy the growing wants of the town. In one high-class district, 80 gallons per head per day has been distributed, and no discoverable waste been noted.

The town in which I at present reside is supplied with 15 gallons per head, of which at least 6 gallons pass through meters for trade purposes; but the water-works engineer knows that there are many towns with double his consumption per head whose inspectors are doing as good work as himself in preventing waste. It is an old-fashioned town. Many of the houses have rain-water tanks, which relieve the water-works on wash-days; and even in this town the advance of sanitation, converting privies into water-closets, and providing more apparatus for the use (and waste) of water, has jumped up the consumption quite 10 per cent. in twenty years. But were the engineers of some of the towns north of the Tweed told what the consumption worked out per head, they would state that this quantity was too little to keep any town decently clean.

In my own little experience, I have come across water engineers who have written books on the subject of water supply—instancing the number of gallons per head they had found sufficient for the supply of manufacturing towns—and who a few years after, on being removed to other towns, considerably altered their opinions, and bitterly regretted, under the warm cross-examination of some clever parliamentary lawyer on the opposition side, that they had placed their opinions in print. I can also appreciate "A Distributing Engineer's" argument as to the fallacy of computing the quantity of water delivered by multiplying the capacity of the pump-barrels by the number of strokes, and deducting a percentage therefrom for slip. In some deep wells, during a short-water period, with the pumps running slowly, the actual quantity delivered per stroke was far below that delivered by the same pump running at its normal speed. But both were reckoned in the same manner; the well being thus credited with a higher minimum than actually was the case. I regret, however, that I have had no practical experience of either the "Venturi" or the waste-water meter, to speak positively of their merits or otherwise. The engineers I have come across seem almost equally divided in their opinions as to the better system of the two for measurment; while a third, and by no means small, section pin their faith in automatic level recorders and other methods, which they assert give equal results at less expense than the newer apparatus.

In thanking "A Distributing Engineer" for the fair manner in which he has approached the somewhat irritating questions of garden watering, in these days of nearly maximum consumption with minimum yield of springs, I trust that more practical engineers than myself will give us some of their experience in this matter. The British Association of Water-Works Engineers seem somewhat diffident in tackling this subject; but perhaps in the near future they may justify their existence by appointing a Committee to procure returns of the quantities delivered to various towns, and the true causes of the astonishing variations in the quantities delivered per head which such returns would most undoubtedly show.

Sept. 6, 1899. "QUOD POTUI PERFECI."

Dungannon Gas Supply.—Owing to a disagreement with the Dungannon Gas Company as to the erection of some lamps in the town, the District Board, at their meeting last week, decided to convene a public meeting of the ratepayers at an early date to consider the present price of gas, and also the question of purchasing the gas-works.

Shrewsbury Gas Company.—The accounts of this Company for the year ended June 30, to be presented at the meeting on the 27th inst., state that the twelve months' profits were £5136. A dividend for the year of 7½ per cent. leaves £183 to be carried forward; compared with £111 brought forward. The gas consumption has increased by 5·31 per cent.; and 549 slot meters and 156 cooking-stoves have been fixed during the year.

The Leeds Corporation Gas Committee and the Supervision of Street Lighting.—At the meeting of the Leeds City Council on Wednesday, Alderman Lowden presented the minutes of the Gas Committee, which contained an expression of opinion that the Sub-Committee having charge of street lighting should be a Sub-Committee of the Gas Committee instead of the Lighting Committee. Mr. Wilson took exception to this expression of opinion, and moved that it be expunged from the minutes. Mr. Midgley seconded the amendment. Mr. Smithson thought it would be inadvisable to make an alteration in the constitution of the Committees so soon after they had been reorganized. As a member of both the Gas Committee and the Lighting Committee, he was in favour of the present arrangement. Alderman Lowden briefly stated the reasons why the Gas Committee had thought it advisable to have the Sub-Committee in charge of street lighting working in conjunction with the Gas Committee. The amendment, however, was carried.

Gas v. Electric Lighting at Halesowen.—At a meeting of the Halesowen District Council last Wednesday, the Electric Lighting Committee reported that they had waited upon the Directors of the Halesowen Gas Company with the view of discussing the question of acquiring the undertaking; but they were informed that the shareholders were not willing to sell. The Chairman of the Company, however, stated that if the Council would make the Company an offer to purchase, he would bring it before the proprietors, and obtain their definite decision. The Committee recommended that the question of purchasing the gas-works be not further proceeded with, but that the Clerk be directed to communicate with the British Electric Traction Company and the Midland Electric Power Distribution Company, inviting their representatives to attend the next meeting of the Council, with the view of arranging terms by which one of them could take over the powers of the Council for the supply of electricity for lighting and other purposes within their area.

MISCELLANEOUS NEWS.

A GAS-WORKERS' AGREEMENT AT HALIFAX.

A Unionist Protest—The Gas Committee Supported by the Council.

A section of the labour portion of the community of Halifax are much perturbed over an agreement which the Gas Committee of the Corporation have introduced at the works for the employees to sign, if they so please. The feeling with which the agreement is regarded is shown by the heading of a placard—"White Slavery at the Gas-Works"—which has been conspicuously posted about the town. The terms of the agreement (in which we fail to detect anything of an inequitable nature) are as follows:—

Memorandum of Agreement made the day of One thousand eight hundred and ninety-nine, between of hereinafter called "the Servant," of the one part, and Thomas Holgate, Engineer to the Gas Department of the County Borough of Halifax, of the other part, as Agent for, and on behalf of, the Mayor, Aldermen, and Burgesses of the said Borough, hereinafter called "the Corporation."

1.—The Servant hereby agrees to serve the Corporation, and the Corporation hereby agrees to employ him for months certain, and thereafter subject to seven days' notice in writing on either side; and in case of disobedience, intoxication, or absence from or neglect in his work, he may be summarily dismissed.

2.—And the Corporation hereby agrees to pay to the Servant wages at the following rates:—

	s.	d.		
Whilst working as a Stoker . . .	5	0	per shift of	8 hours;
Whilst working as a Fireman . .	5	0	per shift of	8 hours;
Whilst working as a Coal Wheeler .	4	0	per shift of	8 hours;
Whilst working as a Coke Wheeler .	4	0	per shift of	8 hours;
Whilst working as an Engineman .	4	8	per shift of	8 hours;
Whilst working as a Yard Labourer	24	3½	per week of	53 hours;

(overtime to be paid for at the rate of time-and-a-quarter on week days, and at the rate of time-and-a-half between the hours of six a.m. on Sunday and six a.m. on Monday) at the end of each week, but subject to a proportionate deduction at the rate aforesaid in the event of the Corporation not requiring the services of the servant on Sunday in any week.

3.—And the Corporation hereby agrees to pay to the Servant a bonus of 2½ per cent. upon the wages earned by him upon the satisfactory te mination thereof as certified by the said Engineer.

Signature of the above-named Servant:—
Witness:—

Signature of the Engineer:—
Witness:—

At the last monthly meeting of the Halifax Trades Council, there was considerable discussion in regard to the agreement, which, it was stated, was being submitted to the workmen employed at the works and to all seeking to obtain situations there. It was reported that men who had been formerly employed at the works had been sent for to start work as usual. On arriving there the agreement was presented to them; but five of the men refused absolutely to sign. Upon this, they were not allowed to commence work. Members of the Trades Council condemned the terms of the agreement, holding that they gave the Gas Engineer absolute power to bargain individually with each workman, and prevented the men from taking collective action for the improvement of their position. The agreement was described by several delegates as being worse in character than any which Colonel Dyer ever attempted to force upon the engineers. After considerable discussion, a Committee were appointed to draw up a memorial to be presented to the Council; and it was also agreed that a deputation should wait upon the Town Council at the next meeting. Steps were taken for the organization of several public meetings by the Trades Council and Workers' Union to protest against the action of the Gas Committee.

Early in the week, the Gas Committee held a meeting to discuss the question as to whether the agreement binding the employees at the gas-works to stay throughout the season was compulsory or not. The members present recorded their unanimous opinion "that it was never understood that the signing of the workmen's agreement should be compulsory; but it was intended that the signing should be optional on the part of the workmen."

Several meetings called by the local branch of the Gas Workers' Union have been held. At one, in the Mechanics' Hall, on Tuesday, Mr. A. Taylor, who presided, remarked that, since the agitation against the agreement was commenced, the Gas Committee had declared that it was optional with the workmen whether they signed it or not. Their complaint was that a conditional agreement was worse than an absolute agreement, inasmuch as it enabled one individual to be played off against another. A resolution calling upon the Town Council to unconditionally withdraw the agreement, and to declare void the signatures already received, was carried unanimously. The men who had signed had, it was urged, regretted their action. They had not realized that the agreement was of the nature which they now knew it to be. The men, while they could not leave, could be dismissed for disobedience at once. Disobedience, the speakers contended, was capable of a wide interpretation, and might be taken advantage of whenever convenient.

At the meeting of the Town Council on Wednesday evening, a deputation was received from the Trades and Labour Council and the Gas Workers' Union with regard to the agreement. They presented a memorial, in which it was urged that the agreement was of such a nature that it could not be accepted by those to whom it was intended to apply, and that the Gas Manager, on his own responsibility or otherwise, was unduly influencing both existing employees and persons seeking employment to sign the agreement. The memorialists asked that the agreement should be unconditionally withdrawn, that the effects of the signing of the agreement by those who had already signed should be nullified, and that all persons communicated with by the Manager who had been rejected on account of their refusal to sign should be offered employment on the usual terms. Mr. H. L. Barrett, as one of the deputation, stated that they had come to the conclusion that the introduction of the agreement was nothing less than a blow at trade combination. One reason which led them to suppose this was that the men were being asked individually to sign the document. A second

reason was that the introduction of the agreement had followed a demand sent from the Workers' Union, as representing the men, for improved conditions of labour. Another proof that the agreement was intended as a blow against trade combination was that all new comers to the gas-works were asked to sign. These men were practically compelled to sign or to leave. As a matter of fact, six individuals were sent for to start; and when they reached the works they were told that they would have to sign the agreement. The men—all honour to them—declined to sign; and they had to leave without obtaining employment. Men who had signed the agreement would give anything to withdraw their signatures. They had understood, however, that it was obligatory upon them to sign. The memorialists protested against the method being employed to break down the men's organization. With regard to the bonus offered, it proved conclusively that, had the Gas Committee been sincere in their desire to improve the condition of the men, they could have given them an advance of wages without any agreement or document whatever. The men wanted neither a compulsory nor an optional agreement. Mr. C. H. Moore, another member of the deputation, also spoke. For a corporate body to ask any particular individual to append his signature to an agreement of this kind was, he stated, a most unfair and unjust proceeding. A man who signed the agreement bound himself to the Gas Committee, as agent of the Corporation, for the specific number of months inserted in the agreement. To preclude a man from any advantages which might be offered to him was not only unfair, but it was contrary to custom. Collective bargaining on one side only was very objectionable. This agreement bound the individual worker to the service of the Corporation, without any advantage to the individual worker himself; and he trusted that the Town Council would refuse to endorse it.

The deputation having retired, a long discussion ensued. Mr. James Parker opened it by moving that the requests contained in the memorial presented be acceded to. He said the agreement was onesided, and was a return to the tactics of Mr. George Livesey of the South Metropolitan Gas Company. He was glad to state that, whereas they had only 160 men organized within the gas-works before the introduction of the agreement, there were now close upon 300. Therefore, in this regard, the Gas Committee had done some good in bringing them nearer collective bargaining on behalf of the men. It was only when men could make their demand collectively that they had any chance of having their grievances remedied. As to the bonus offered to the men on the completion of their period of engagement, it simply amounted to 7¼d. a week, as against an advance of 2s. 2½d. per week asked for by them. The men were now working for ½d. per hour under the standard price. There was, he submitted, no necessity whatever for the agreement, because, under the Conspiracy Laws, gas-works were specially protected against strikes. Mr. Crossland, seconding the resolution, appealed to the Council to endeavour to promote liberty and manhood at the gas-works rather than serfdom, slavery, and discontent. Alderman Woodhead, the Chairman of the Gas Committee, assured the Council that no blow at Trades Unionism was ever intended. The Committee had no objection to the men combining. They wanted them to have liberty, and to be at liberty; but they also wanted them to have the liberty, if they chose, to sign an agreement which would secure them employment for a period. He had always thought that it was to the interests of the workers that they should have employment secured to them for a considerable time. The Committee considered that, by offering this employment, they would possibly get a better class of workers, and would get better service. He was not complaining of any past service. If, however, they could get them, they wanted to secure a better class of workmen; and the inducement held out was the bonus at the end of their engagement. The idea was conceived solely in the interests of the men employed. He had been associated with the Committee for seven years; and he unhesitatingly asserted that, at all events during that period, their employees had been generously dealt with. It was not, he believed, their own men who were complaining. The Committee had always shown a readiness to investigate in a generous spirit any application coming from their own workpeople. They refused, however, to recognize the intervention of a third party. It was absolutely untrue, as the memorial presented alleged, that undue influence had been used in seeking to induce men to sign the agreement. There was some truth in a statement made that men who applied at the gas-works, in response to a post-card, were sent back. This, however, was done under a misapprehension; and these men had since started work without being asked to sign. The agreement was not compulsory, but optional; and the Gas Committee claimed that it ought to be optional. It had also been hinted that the agreement was intended to bar workmen from advancement. It was intended to do nothing of the kind. If it was ascertained that any worker, even though he had signed, wished to leave to better his condition, he would be at liberty to do so. The Committee, as during the past seven years, would deal with their workmen in a fair and liberal manner. He believed that the men themselves were satisfied. Perhaps some dissatisfaction had been created; but he had no hesitation in stating that, if there was any discontent, it was the result of outside agitation. He should be very much surprised if, after explanation, the men did not see their position in a new light. The Committee received in January last a communication from the Gas Workers' Union, demanding an all round advance of wages at the gas-works. This application, had it been granted, would have meant an advance in wages of over £2000 per annum. The Committee, after investigation, found that they were paying wages equal to any Corporation within a long distance from Halifax. A significant fact was that only last June the Union made application to the Bradford Gas Committee for an advance to the yard labourers of from 5¼d. to 5½d. per hour; and the reason given was that in Halifax they were paying the higher wage. This, he held, proved conclusively that they had been treating their men well. The Council had got to take their choice whether the gas-works should be conducted by a duly elected body, chosen by the ratepayers, or whether they should be handed over to the control of an outside Union. The Mayor did not believe the men, if they looked at the agreement in the same light as he did, would ever ask for it to be rescinded. If any man had signed it, and would like to be released, the Committee would be quite agreeable to do so. The agreement was more a premium on good workmanship and steady, persevering conduct than anything else. The only desire of the Committee all through had been to treat those men well who had stuck by them in the past, and who were willing to continue to serve them in the future. Several other speakers carried the discussion to a considerable length; and it terminated in the complete defeat of the members who sought to have the agreement rejected—the voting being for the resolution 12, and against 26.

A UNIFORM PRICE FOR GAS AT BLACKBURN.

At the Monthly Meeting of the Blackburn Town Council last Thursday, the Gas Committee recommended that, as from the end of the current quarter, a uniform price of 3s. per 1000 cubic feet be charged to all consumers within the borough; thus reducing the charge to private consumers 7d. per 1000 cubic feet, and increasing the charge for engines and cooking-stoves by 3d. per 1000 feet. The Town Clerk read a memorial on this subject from numerous gas-engine users, urging that an increase of price was unjustifiable, and would prove an impediment to small traders. Alderman W. Thompson, in justifying the action of the Committee, said that somebody must of necessity suffer in a rearrangement of this character, but he thought that substantial justice had been done. If they made an exception in favour of gas-engine users, they broke the principle of the uniform charge. There was, he knew, a feeling that the big consumers ought to have concessions; but private consumers, he pointed out, used 58 per cent. of the gas manufactured, or three times as much as the mills, which, moreover, only took gas four months in the year. Their consumption had decreased since the Corporation took over the gas manufacture, and the cooking-stoves were only taking 12 per cent. of the total output. On all hands, therefore, the private consumers were entitled to consideration in the rearrangement. In the course of the discussion which followed, Mr. W. Tattersall moved that the recommendation of the Committee be referred back; but this was lost on a division, and the minutes were confirmed.

THE PROPOSED INCREASE IN THE PRICE OF GAS AT MIDDLESBROUGH.

The situation (says the "Northern Echo") which the Middlesbrough Town Council have to face with reference to the recommended increase in the price of gas is that, without some substantial advance, there is a prospect of a loss on the year's working. It is stated that there will be an increase of £5000 for raw material, and there is £1000 more to pay towards interest and redemption, owing to the extensions taking place. There is not the £2119 to pay as in 1898 to wipe off the retort account; but as the profit last year was only £1858, there will be an estimated deficiency of over £2000. A twopenny increase per 1000 feet will realize about £3600; and this advance is the one recommended. So far as the increase in raw material is concerned, it is legitimate enough to raise the price of the product in proportion. But the incident reveals to the general ratepayer a somewhat unsatisfactory state of things. Production has not kept pace with capital outlay during the last ten years; and the assumption is that prior to 1890 several necessary items of expenditure in the way of extension or renewal had been deferred when they might have been taken in hand at the time, and thus consumers of the day have been called upon to pay their share. It is to be feared that municipal undertakings do not always receive that careful financing that private enterprises do. The question now forced upon the Council is whether the 2d. per 1000 feet increase is sufficient. The electric lighting undertaking is getting on the way towards a definite commencement; and if further increases have to be made in the price of gas two or three years hence, it may induce more to go in for electric light, and for a time at least lessen the consumption of gas.

HARROW AND STANMORE GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Monday last week, at the Albion Tavern, Aldersgate Street, E.C.—Mr. James Glaisher, F.R.S., presiding.

The Secretary and Engineer (Mr. J. L. Chapman) read the notice calling the meeting; and the report and accounts were submitted.

The Chairman, in moving their adoption, said he was certain that every shareholder who had looked over the balance-sheet with care had felt satisfied that it was a good one. But although much information was given in the accounts, he would add a few facts. The coal carbonized amounted to 3250 tons; being 139 tons more than in the corresponding period of last year. The gas made was 33,130,000 cubic feet; being an increase of 1,341,000 cubic feet. The gas sold was 30,658,000 cubic feet, or an increase of 2,788,000 cubic feet. The gas made per ton of coal carbonized was 10,194 cubic feet; and they received payment for 9433 cubic feet per ton. The gas unaccounted for was 1,982,000 cubic feet, which was very nearly 6 per cent. Those who were present at the meeting last year knew that he had then to speak of unaccounted-for gas to the extent of 11¼ per cent.; and they were very puzzled to find out how such a leakage could have taken place. He himself thought the station meter must have been read wrongly, or that a mistake had been made somewhere; but he believed they never satisfactorily discovered how it arose. However, there had been an improvement; and the result was vastly better than last year. The quantity of gas sold in the Harrow district was 16,149,000 cubic feet, in Sudbury and Harrow Weald 3,935,000 cubic feet, and at Stanmore 6,864,000 cubic feet. Being desirous of ascertaining how these increases had taken place in each district, he had taken out the following figures: In the Lady-day quarter at Harrow, they sold 10,220,000 cubic feet; being 126,000 feet more than in 1898. In the Midsummer quarter, they sold 5,929,000 cubic feet; being 629,000 cubic feet more. Mr. Chapman largely attributed the considerable increase in the latter quarter to the extension of the use of cooking-stoves; and, if this was so, it was satisfactory that, in the period of the year when gas was not required so much for lighting, it should be becoming more and more used for other domestic purposes. They therefore sold in the half year in the Harrow district 16,149,000 cubic feet, which was an increase of 755,000 cubic feet, or close upon 5 per cent. He did

not know that he had ever had such a large increase to mention in connection with Harrow; and for many years he had been distressed to have to complain uniformly of the slow progress there. Regarding the Sudbury and Harrow Weald district, in the first three months they sold 2,455,000 cubic feet, which was 491,000 feet more. This was very good; and, as there had been more houses built in the neighbourhood, this implied a permanent increase. Then in the second quarter, they sold 1,480,000 cubic feet, being an increase of only 26,000 feet. The difference in the increases of the two quarters in this district confirmed his view that there was plenty of room there for cooking-stoves, if Mr. Chapman's solution of the cause of the increase in the Harrow district was the true one. However, the increase there in the half year was equal to 15 per cent. At Stanmore, they sold 4,374,000 cubic feet in the first three months; being an increase of 451,000 feet. In the second quarter, they sold 2,490,000 cubic feet, which was an increase of 375,000 feet—making 826,000 feet for the half year. Going back to the June half of 1896, which was the first six months in which they had all these districts within the Company's area, they sold 21,898,000 cubic feet; and now, three years later, it had reached 26,948,000 cubic feet, which was an increase of 5,050,000 cubic feet, or at the rate of 23 per cent. This, he thought, would be considered satisfactory. The growing demand for gas, together with the additional cost of coal, had caused the Directors to turn their attention to carburetted water gas. When coal was cheap, he did not think water gas was of much advantage to gas companies; but, on the contrary, when coal was dear water gas was of considerable benefit. If (say) 1 ton of coal was bought at the pit's mouth, its carriage by water to London cost a little more than 3s.; but the railway charge for carrying a ton to Harrow was 9s. Then, in addition, there was the cost of cartage nearly three miles from the North-Western Station, or more than a mile from the Metropolitan Station. The cartage of the coal from the railway to the works also meant a considerable handling of the coal, and consequent deterioration; and, in addition to this, there was not a great demand for coke at Harrow. They had therefore two *stimuli*—the price of coal, which would probably rise further; and coke, which was somewhat of a burden to them. Therefore, they had decided to have a carburetted water-gas plant, which it was hoped to have in use before the coming winter, to meet the increasing demand for gas. Regarding the public lighting, the amount of gas used had increased in the past three years by nearly 24 per cent. The Local Authorities, it seemed, had lengthened the time of lighting by two hours every night; and some of the districts had, in addition, gone in for lighting the lamps all night—even full-moon nights. He hoped all places would follow this example, because he had seen full-moon nights which were very dark indeed. Speaking next of the residuals, he said the quantity of coke and breeze made was 2112 tons, and sold 1834 tons. The tar made was 35,278 gallons, for which they obtained about 1d. per gallon. The total expenditure during the half year was £5568, or an increase of £541; and the total receipts £8456, which was an increase of £927. Therefore, the profit, which was £2898, was higher by £386. It was now fourteen years since there had been an increase in the dividend; and, with the prospect of continued good business, the Directors had decided to advance the dividend by ½ per cent. on the 10 per cent. capital, and by 7s. per cent. on the 7 per cent. capital.

Dr. J. W. L. Glaisher seconded the motion, which was unanimously carried.

Dividends were declared at the rate of 8 per cent. per annum on the original "A" capital, of 7 per cent. on the additional "B" capital, of £5 12s. per cent. on the additional "C" capital, and of 6 per cent. on the guaranteed shares.

Resolutions were also passed, thanking the Chairman and Directors and Mr. Chapman for the faithful discharge of their duties; and, in the course of the remarks made, Mr. A. F. Phillips and other gentlemen spoke of the general expansion of the district and of the improved prospects of the Company.

NORTH MIDDLESEX GAS COMPANY.

The Directors of the North Middlesex Gas Company, reporting on the working of the past half year, state that there has been an increase in the sale of gas (the actual extent is not mentioned), and a satisfactory improvement in the prices realized for residual products. Further enlargement and renewal of mains during the six months has involved a heavy charge against the revenue, in addition to which certain special law, parliamentary, and other expenses have been incurred. It is also announced that the carburetted water-gas plant has been in operation throughout the half year, with satisfactory results. The secretaryship has been accepted by Mr. Ernest L. Burton, and Mr. Lewis Hardy succeeds him as Auditor. The revenue account shows that the receipts for gas amounted to £7008, of which £507 was for public lighting. The total consumption of gas for private purposes was 32,504,000 cubic feet, for which the charge was 4s. per 1000 cubic feet; and the consumption for public purposes was 2,536,300 cubic feet. The rental for stoves was only £40, and for meters and fittings £248. The high price of gas is no doubt responsible for the smallness of these items. The residual products produced £1129. Interest on mains and transfer fees made up the income to £8434. On the manufacture of gas £4088 was spent, of which £2868 was for coal, oil, coke, &c. We do not recollect having before noticed in gas accounts a charge being made for the coke used in manufacture. In the distribution of gas £801 was expended; and rates and taxes required £388. Management absorbed £687; but £84 of this is attributable to expenses incurred in connection with the retirement of the former Secretary. Retiring allowances are entered at £110; and £90 has been paid for three years' law and parliamentary charges. The total expenditure came to £6196; leaving £2237 to be carried to the profit and loss account. After meeting the claims for interest, the balance of net profit available for distribution is £2960. A dividend at the rate of 10 per cent. per annum is to be paid on the original capital and 7 per cent. on the ordinary capital. This will absorb £2081, and leave to be carried forward £878, which is about £240 less than the sum brought forward. It is proposed to make a further issue of capital at the end of the year.

ELECTRIC LIGHTING NOTES.

The Grimsby Town Council last Tuesday accepted tenders for the plant required for their electric lighting works, amounting to £31,606.

The Tynemouth Town Council on Tuesday accepted a tender, amounting to £5533, for the erection of a power station in connection with the Corporation electricity supply.

The Town Clerk of Darlington reported to the Town Council last Thursday that he has received the sanction of the Local Government Board to the borrowing of the sum of £25,940 for electric lighting purposes.

The Salford Town Council last Wednesday adopted a recommendation of the Electric Lighting Committee that application be made for sanction to the borrowing of £5000 for transformers, meters, &c., required during the next twelve months.

The Whitby District Council last Tuesday adopted a scheme of electric lighting, formulated by Messrs. Preece and Cardew, and involving an expenditure of £26,000; but they will first proceed with an installation on a smaller scale, which is estimated to cost £18,500.

Large contracts for new machinery have been entered into by the Liverpool Corporation Electric Lighting Committee. One firm has received an order to supply to the Lister Drive and Cobb's Quarry stations four triple expansion engines, each coupled to a multipolar dynamo of Siemens' make, at £6939 each set, and also three compound engines, each coupled to a two-pole dynamo of Siemens' make, at £1377 each. Another firm has secured the contract for the work required in the erection of an electric-power station at Lister Drive for £49,783.

The Works Committee of the Ventnor District Council, at the meeting of the members yesterday week, recommended that an offer of the Electric Lighting Company should be accepted for the lighting of the town. The proposal was to use 32 arc lamps at £15 each, and 91 incandescent lights at £2 10s. each; making an outlay per annum of £707 10s. To this must be added the expense of lamps already erected and the principal and interest on the others, which would make the total annual expenditure for seven years £787. The cost of lighting the town last year was only £511. In face of the considerable difference, the Council could not come to any decision on the subject, and the matter is to be brought before them again; but, in the meantime, the Electric Lighting Company are to be asked to furnish an alternative scheme for lighting the whole town with incandescent electric lamps.

SOUTH STAFFORDSHIRE WATER COMPANY'S NEW PUMPING STATIONS.

The South Staffordshire Water-Works Company's supply of water is increasing at a very rapid rate—something like 4500 houses being annually connected to the mains, or equal to a population of from 22,500 to 25,000. This large increase necessitates continuous extensions to plant; and we are informed by Mr. H. Ashton Hill, M.Inst.C.E, the Engineer to the Company, that at the present time three new pumping stations are in hand. At Kingswinford, near Kidderminster, two boreholes, 33 inches diameter, are being made, from which it is anticipated that more than 2 million gallons per day will be pumped by a horizontal compound engine having cylinders of 48 inches and 80 inches diameter, and 6 feet stroke. This engine is 349-horse power, and will lift and force 2¼ million gallons per day against a total head of 738 feet into a covered service reservoir, having a capacity of 3½ million gallons, which has been recently constructed at Springsmire, near Dudley. Another pumping-station has been commenced near Trent Valley Junction, Lichfield; and at this place two boreholes, 30 inches diameter, are now being made. The engine—for which a contract has been let to Messrs. Hathorn, Davey, and Co., of Leeds—is of the triple expansion horizontal type, actuated by 140 lbs. steam. It will be capable of lifting 1½ million gallons per day against a total head of 412 feet; and it will be arranged for pumping through 12 miles of mains into the reservoir at Burton-on-Trent, or into the South Staffordshire district beyond Walsall, as may be desired. A site for a third station has been secured, and plans will be at once prepared; but the Engineer has not at the moment settled whether to sink a well or to adopt a borehole scheme. During the recent drought, several temporary installations of pumps and boilers had to be made. It is expected that the whole of the new works, together with the necessary mains, will be completed within the next three years.

NOTTINGHAM CORPORATION WATER UNDERTAKING.

Annual Report and Accounts.

The report and statement of accounts of the Nottingham Corporation Water Department for the year ending the 25th of March has been issued. The report states that the revenue was £4138 more, and the expenditure £440 more than in the previous year; the latter being caused by increased interest on loans, &c. After paying the annuities and interest on loans and consolidated stock and the annual contributions to the different sinking funds, the ultimate balance of profit amounted to £6125, which the Committee propose to carry forward to the account established to provide for depreciation, renewals, compensation under the Workmen's Compensation Act, 1897, and other purposes. The profit and loss account shows that the total revenue was £78,255, which includes £76,344 water-rents. The working expenses amounted to £27,803, which includes £7363 pumping expenses and repairs, £4915 salaries and incidentals, and £5380 parochial rates and taxes. The annuities account comes to £23,755; and the interest on consolidated stock to £10,403. The net profit was £6125. The capital account shows that the water proportion of the Nottingham consolidated 3 per cent. stock at Lady-day amounted to £346,794; and the proportion on ordinary loans to £30,000. The year's expenditure included £10,166 for mains, and £5584 for laying them; and £1598 for service-taps, and £2144 for laying. Additional borings at Bestwood cost £890; while £863 and £1828 had been spent on the Boughton and Burton Joyce new works respectively. The sum of £2302 had also been laid out on additional land at the Castle works.

THE PRESENT AND FUTURE WATER SUPPLY OF LONDON.

The "British Medical Journal" for the 19th ult. contains an ably-written article on the above subject from a correspondent who has well studied the question. Dealing first with the risk of scarcity, he remarks that a supply which a few years ago seemed ample—almost inexhaustible—is at the present moment, in the opinion of many, scarcely adequate for our immediate wants. According to numerous authorities—some political, some mercenary, and some simply perhaps purely meddlesome—there is in the near future a probability of a general drought in London compared with which last year's local scarcity in the East-end would fade into insignificance. Should the reports of a water famine which have been published broadcast be found only to have a slight foundation, it still leaves an uneasy feeling as to what would happen to over 5 millions of people should such an eventuality arise. Given a smaller average rainfall, and therefore a decreased flow of water in the Thames, the public jump to the conclusion, ably assisted by a certain section of the Press, that their water supply is giving out altogether. At the present moment there are two parties in the water world—the Water Companies and the London County Council. The former maintain that, with a normal rainfall, and on the completion of their new reservoirs, the Thames is competent to supply the needs of all London, not only at present, but for the next thirty or forty years. The London County Council, on the other hand, urge that the Thames as a water supply is deficient both in quantity and quality; and as this state of things will continue to get worse instead of better, it is high time to turn to another source altogether for our supply. The Water Companies have immense interests, and are constantly increasing their storage reservoirs and filtering areas, and hence the value of their property; and one would think that their interests should be identical with those of the population they supply. Much of the abuse that has been showered upon the Metropolitan Water Companies has been wholly undeserved; and although the inconvenience and ill-effects of the apparent scarcity seem sufficiently grave, they have doubtless been greatly exaggerated by agitators for their own purpose.

Having given a few details as to the existing water supply, the author proceeds to consider the principal source—the Thames. On this matter he says: The drainage area of the Thames above the intakes of the Water Companies is 3548 square miles; and the average yearly rainfall above the intakes for the past sixteen years—namely, from 1883 to 1898—has been 26·43 inches, which is equal to a daily supply of 800 million gallons. The daily average flow in the Thames for the last four years has been: In 1895, 1138·7 million gallons; in 1896, 773 millions; in 1897, 1374·4 millions; in 1898, 642·3 millions. As a matter of fact, it has been equal to about 1300 million gallons for a cycle of years, out of which the greatest permissible daily quantity that can be taken by the Water Companies is 150 million gallons, which is a small proportion of the total volume of the Thames. There has been a considerable growth of the population in each Company's district for several years past, with a consequent increase of the daily amount of water used; but even with this there has never been any general scarcity. They have had, in some instances, to draw an extra quantity of water; but there has always been sufficient to meet the extra demand. Of late years there have been unusually dry seasons, but there are no indications of a probability of their continuance; and the remedy may be found in efficient storage against the times of scarcity.

Below is a table of the rainfall and the volume discharged at Teddington Weir for sixteen years (1883 to 1898):—

Rainfall for the Year.		Volume Discharged.
Maximum, 33·31 inches	..	6,596,476·4 million gallons
Minimum, 21·32 ,,	..	234,421·0 ,, ,,
Average, 26·43 ,,	..	409,291·0 ,, ,,

The above table of the volume discharged at Teddington Weir shows the amount of water at that point after the Companies have taken what they require some miles above. The minimum flow over Teddington Weir is supposed never to be below 200 million gallons per diem; but it has fallen as low as 77 million gallons.

The Thames storage reservoirs are capable of containing 1193 million gallons; but others calculated to hold an additional 4983 million gallons will, it is hoped, be completed in about four years. The total amount of water would be then 6176 million gallons, which, allowing for loss by evaporation, &c., would work out roughly, allowing 35 gallons a head per diem, to about 40 days' supply. When this is an accomplished fact, I do not consider we shall be in any danger of a scarcity of water. It will be ample not only for our immediate wants, but for those of distant years, with which the present generation will certainly have no concern.

Dealing next with the growth of London, the writer says: It is maintained by a considerable number of authorities that what may be sufficient for the wants of the present population will not be anything like enough for that of (say) 1930. To-day London contains nearly 6 million people. It was estimated by Lord Balfour's Commission that the population of Greater and Water London would in the year 1930 reach the stupendous total of between 11 and 12 millions, and that the daily quantity of water necessary for this population would be 393,750,000 gallons. The London County Council put these figures somewhat higher. To meet these, to say the least, somewhat speculative requirements, Lord Balfour's Commission stated that the following supplies could be provided: The Thames, 300 million gallons; the Lea, 52·5 millions; wells in the Lea Valley, 40 millions; wells in the Kent Company's district, 27·5 millions—total, 420 million gallons, or sufficient, with adequate storage, to supply a population of 12 millions at 35 gallons per head. Now, in the first place, there is no record in ancient or modern times of any town with this number of inhabitants; and, in the second, it is an extremely doubtful contingency that this city should for the first time in the world's history reach such an exceptional scale of magnitude.

Passing on to consider the Welsh scheme of the London County Council, the writer says the Council undoubtedly hold a strong hand in their scheme for a "pure Welsh water supply for London." Their idea is to take over the control of the Metropolitan Water Companies, and at the same time obtain a perpetual abundance of pure water from the Welsh hills. The drainage area contributing to this supply is said to be about 200 square miles, more or less; while if the whole available drainage area be taken into account, it is 488 square miles. If the rainfall available for supply and compensation be taken at 28·5 inches over the whole area, that for supply alone will be 21·4 inches, or 415 million gallons a day. Here we have what will be an absolutely pure water. At the same time, it must not be forgotten that the land to be appropriated has at present a fair population, and, in the construction of the works, several villages with their churches and graveyards will have to be submerged. The ultimate risks of pollution are, however, almost *nil*: and this can never be said of the Thames, no matter how careful we may be in our endeavours to prevent contamination of the river. It is proposed to bring the water from the Welsh districts in two instalments, and in the meantime to continue using the Thames, regarding it as an alternative or contributory source of supply, if for no other reason than the undesirability that the Metropolis should be dependent upon one source, which might be liable to accidental interruption. These two instalments will be about 200 million gallons each, will come from the Wye and the Usk and Llangorse reservoirs, costing over £38,000,000, and will, it is said, provide for the contingencies of the next fifty years. The Welsh water will be very soft; and as the action of this kind of water on lead piping is well known, it is fraught with a certain amount of danger, the importance of which we cannot afford to overlook.

The writer next deals with a branch of the subject strictly appertaining to the publication in which his article appears—viz., Thames water and disease. On this matter he says: The solution of the difficulties with regard to the Thames supply for London may be found in the provision of increased storage, settling-tanks, and reservoirs, which would capture and hold the surface waters of a rainy period, at present allowed to run into the sea; but the same holds good for the Welsh waters. The question on either side is one of storage. In the Welsh scheme, advantage must certainly be taken, as in the Thames Valley, of the flood waters, and they greatly excel those of the Thames in purity; but they will have to be stored and subsequently filtered. Both Sir William Crookes and Professor Dewar have said that flood water might be taken without the least harm to anybody, provided it underwent efficient filtration; and it has been stated that for thirty years no water-borne disease has been traced to the London Water Supply. Mr. Shirley Murphy found that during a period of four consecutive years, including 1894, the year of the great floods in the Thames district, with the increase of flood water there was a distinct increase in the notifications of typhoid fever, and a corresponding increase of the organic impurity in the water, and in the amount of oxidizable organic matter as determined by Tidy's process. This may have been only a coincidence; but still it is a curious one. The time—four years—was not long enough. Observation through a larger number of years would be necessary before we should be able to arrive at any positive conclusion. It may be asked: Why have not continuous records been taken, including other years of flood? Simply because the previous floods occurred before the Infectious Diseases Notification Act came into force. I say "notification," as it is quite impossible, in a city such as London, and with its population, to judge from the death-rate whether typhoid fever has been water-borne or not. At the same time, it must be allowed that London enjoys a far smaller death-rate from typhoid fever due to any cause than the large majority of the provincial towns, including Liverpool, Birmingham, and Glasgow, with their lake-water supplies.

Coming finally to the *pros* and *cons* of the subject, the author says: I have endeavoured to show the present condition of the water supply of London, the provision being made for the future, and an alternative scheme for obtaining an entirely fresh supply from another source. Whether it will be wise to give up the existing supply, which has done excellently in the past, and will doubtless continue to do so in the future, for another which certainly promises much, but at enormous cost, I will not here discuss. It is a question that is an all-absorbing one at the moment, and has been threshed out by two Royal Commissions, aided by a cloud of witnesses, including most of the experts of the day. To epitomize the matter, I will take the arguments on both sides:—

For the Present London Supply.

1.—A supply of excellent water at our very door.
2.—No water-borne disease has been traced to it for thirty years, and it has stood the test of its consumption by many millions of people for the same period.
3.—It is bacteriologically pure after filtration.
4.—It is neither economically nor commercially too hard.
5.—It has no plumbo-solvent effect on lead piping.
6.—More strenuous efforts are made every year to divert sewage and to prevent contamination.
7.—The actual decrease of pollution.
8.—The present storage on the Thames is being increased to meet the demand, and, as this grows, can be carried on by stages, or be delayed or stopped entirely as circumstances may dictate.
9.—The enormous expense laid on the ratepayers by the construction of aqueducts and reservoirs in Wales.
10.—The possibility of a breakdown in the aqueduct itself.

For the Welsh Scheme.

1.—The increasing population of London and the necessity for a further supply, as what may be sufficient now will not be so for the future.
2.—The increasing riparian population above the intakes of the Water Companies, with the additional risks of pollution.
3.—The prejudice existing against drinking a water which is liable to pollution, however perfect the subsequent purification may be either by natural or artificial means.
4.—A pure water with scarcely any risk of pollution.
5.—An abundant and inexhaustible supply.
6.—A soft water, economical with regard to soap, and commercially expedient for manufactories, boilers, &c.
7.—There is always the risk of an epidemic in our present supply.
8.—With the intercommunication between the Water Companies, it would be difficult to trace and localize any outbreak to the failure and fault of any one particular Company.
9.—As to the expense, the public might be induced to take it up, and ultimately form the scheme into Consols.
10.—If advantage is not taken now of a supply from Wales, some other Northern or Midland town may do so, and London will have lost its opportunity.

WATER SCHEMES FOR WALLASEY.

Proposed Supplies from the Vyrnwy Aqueduct and Elsewhere.

On the recommendation of the Water Committee, the Liverpool City Council last Wednesday confirmed a provisional agreement for a supply of water to the Wallasey District Council, and gave authority for preliminaries to be prepared to enable a Bill to be promoted in the ensuing session of Parliament to permit the necessary works to be executed. It is proposed that the water shall be delivered by a main to be laid and maintained by the Corporation from the Vyrnwy aqueduct to the Wallasey district; and the price to be paid for the water is to be 6d. per 1000 gallons. The District Council are to pay for a minimum supply of 500,000 gallons per day. If they want more than this quantity, they must give three months' notice, stating the increase required. At the expiration of the notice, the minimum to be paid for is to be the increased quantity required to be supplied. The maximum quantity that may be required during the next five years is not to exceed 1 million gallons per day, and the maximum quantity that may ultimately be required is not to exceed 2¼ million gallons per day. The main, when laid, will be the property of the Corporation, who will maintain it, but are not to be liable to reconstruct it. The District Council are to erect and maintain a building to contain a meter for measuring the water at the point where it is delivered into their pipes. The meter is to be provided and maintained by the Corporation; and the District Council are to pay a rent to be agreed upon for it. The estimated cost of laying a 22-inch main from the Vyrnwy aqueduct to the point where the main will join the pipes of the District Council is to be agreed upon between the Corporation and the District Council before an agreement is entered into; and the District Council are for a period of thirty years to pay the Corporation an annual sum equal to 6½ per cent. on the estimated cost. After the expiration of this period, the annual sum is to be reduced to 1 per cent. to cover the maintenance. The agreement may be determinable by either party by five years' notice under certain conditions.

Another scheme has been put forward by a Syndicate, who propose to construct a gravitation system near Chirk, North Wales, and to supply the town with a million gallons a day at 6d. per 1000 gallons without charge for laying the mains. As a temporary supply, it is stated that the West Cheshire Water Company are prepared to furnish a million gallons a day.

The subject of the water supply was also discussed by the Wallasey Council on Thursday. In moving the adoption of the minutes of the Water Supply Committee, Dr. Oldershaw said he was at first under the impression that they could have the Liverpool supply within six or nine months; but they now found the Corporation would have to get parliamentary powers to lay the mains. He did not approve of the terms of the proposed agreement. Mr. Steel seconded the minutes, and said the Liverpool scheme would settle a difficult question for them. They had no information as to the status of the Syndicate proposing the Chirk scheme, which would cost them £18,000 a year, against £11,660 for the Liverpool scheme. The Chairman (Dr. Napier) submitted an estimate, prepared by the Accountant, for carrying out a scheme by the Council. It would, he said, cost £600,000, and was worked out to effect a saving of £2000 per annum against the terms of the Liverpool Corporation. Mr. Lee moved, as an amendment, that the proceedings be referred back. He thought they ought to look for a scheme of their own; and in the meantime get a temporary supply from Liverpool. Mr. E. M'Geoch seconded the amendment. After considerable discussion, Dr. Oldershaw said that the West Cheshire Water Company had told him they would supply Wallasey with a million gallons a day within six months. Wallasey would pay for the main being laid; and the Company were willing to be bound down for a number of years. The cost of this scheme would enable them to sell the water at the present charges, and make a profit. He suggested this as an alternative scheme until they obtained a water supply of their own. The amendment was carried by twelve to nine votes. The minutes were thus sent back; and the Committee were further asked to consider the advisability of sinking a borehole at the Liscard well, and taking steps to secure an additional supply of water.

COWLYD JOINT WATER BOARD.

Local Government Board Inquiry—The Authorities in Disagreement.

Mr. E. A. Sandford Fawcett has held an inquiry, on behalf of the Local Government Board, into an application by the Cowlyd Water Board for power to borrow £30,000 for the purposes of their undertaking. The Clerk (Mr. T. E. Parry) said the application was divided into three heads—viz., £16,000 on account of excess expenditure, £5000 for the purchase of land and watershed, and £9000 for the laying of mains from Sarn Mynach to Llysfaen. The works referred to in the application had been completed; and the whole of the cost had been paid out of a temporary loan from the Treasurer. This had been audited as a suspense account by the Government Auditor. The £16,000 was required for works executed above the previous £30,000, which was the only loan obtained on behalf of the Board. It was sanctioned in 1892. The £5000 was required for the purchase of Lake Cowlyd and its watershed. They had previously an agreement with the joint owners (Lords Ancaster and Newborough) enabling the Board to draw water from the lake to the depth of 4 feet from the Ordnance datum level of 1164·6 feet. But the agreement gave them no protection against pollution; and the purchase was desired in order to secure protection. Subsequently the property between the lake and Dolgarrog was purchased by a Syndicate (Gwalia, Limited); and the Board had agreed to purchase from them certain of the water-rights for £3500. For this the Board received half of the lake and 877 acres of watershed, the whole of which was freehold; and they had purchased the other half of the lake and 289 acres of freehold land from Mr. John Williams, for £893. Another small piece of land which was required made the total purchase-money £4543. Passing to the third section of the application, Mr. Parry said the mains referred to were really auxiliary water-mains for the purpose of supplying Llysfaen. There had been very few complaints from Colwyn Bay and Colwyn since the laying of the mains; but there had been complaints

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 640.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 13	10½	Alliance & Dublin 10 p. c.	21¼—22¼	..	4 13 4
100,000	10	,,	7½	Do. 7 p. c.	15½—16½	..	4 10 11
300,000	100	July 3	5	Australian 5 p. c. Deb.	102—104	..	4 16 2
200,000	5	May 12	6	Bombay, Ltd.	6—6½	−¼	4 12 3
40,000	5	,,	6	Do. New, £4 paid	4¼—4¾	..	5 1 1
380,000	Stk.	Aug. 16	12	Brentford Consolidated	277—282	+5	4 5 1
270,000	,,	,,	9	Do. New	210—215	..	4 3 9
50,000	,,	,,	5	Do. 5 p. c. Pref.	140—145	..	3 9 0
159,375	,,	June 15	4	Do. 4 p. c. Deb.	126—130	..	3 1 7
220,000	Stk.	Mar. 29	11½	Brighton & Hove Orig.	260—270	..	4 5 2
226,320	,,	,,	8½	Do. A. Ord. Stk.	194—197	..	4 6 4
973,500	Stk.	Aug. 16	5	Bristol, 5 p. c. max.	125—130	..	3 16 11
420,000	20	Mar. 29	10	British	44—46	..	4 6 11
50,000	10	Aug. 31	12	Bromley, Ord. 10 p. c.	24—26*	..	4 12 3
75,000	10	,,	9	Do. 7 p. c.	19—21*	..	4 5 8
500,000	10	Apl. 27	6	Buenos Ayres (New) Ltd.	9½—10½	..	5 17 1
420,000	Stk.	June 29	4	Do. 4 p. c. Deb.	100—102	..	3 18 5
150,000	20	July 13	6¼	Cagliari, Ltd.	28—29	..	5 13 10
100,000	10	June 1	7½	Cape Town & Dis., Ltd.	13—14	..	5 7 2
50,000	50	May 2	6	Do. 6 p. c. 1st Mort.	56—58	..	5 3 5
550,000	Stk.	Apl. 13	13½	Commercial Old Stock	316—321	..	4 4 1
200,750	,,	,,	10½	Do. New do.	245—250	..	4 4 0
200,750	,,	June 15	4½	Do. 4½ p. c. Deb.	143—148	..	3 0 10
800,000	Stk.	June 15	10	Continental Union, Ltd.	182—187	..	5 7 0
200,000	,,	,,	7	Do. 7 p. c. Pref.	182—187	..	3 14 10
51,600	Stk	Aug. 31	14	Croydon A 10 p. c.	335—340*	..	4 2 4
168,400	,,	,,	11	Do. B 7 p. c.	265—270*	..	4 1 5
555,000	Stk.	Aug. 16	5½	Crystal Palace Ord. 5 p. c.	132—137	..	3 16 8
60,000	,,	,,	5	Do. 5 p. c. Pref.	140—145	..	3 9 0
486,090	10	July 28	11	European, Ltd.	22—23	−½	4 15 8
354,060	10	,,	11	Do. £7 10s. paid	16—17	..	4 17 1
11,993,075	Stk.	Aug. 16	4⅝	Gas-light and Coke	4 p. c. Ord.	−1	4 11 7
					3½ p. c. max.		3 11 5
2,800,000	,,	,,	3½		4 p. c. Con. Pref.		3 4 0
3,799,735	,,	,,	4		3 p. c. Con. Deb.		4 0 0
3,993,975	,,	June 15	3		100—102	+1	2 18 10
70,000	10	May 31	8	Hongkong & China, Ltd.	13½—14½	..	5 10 4
3,800,000	Stk.	May 12	10	Imperial Continental	223—228	..	4 7 8
473,600	Stk.	Aug. 16	3½	Do. 3½ p. c. Deb. Red.	101—104	..	3 7 4
75,000	5	June 15	6	Malta & Medn., Ltd.	5—6¼	..	5 9 1
560,000	100	Apl. 4	5	Met. of 5 p. c. Deb.	112—114	..	4 7 9
250,000	100	,,	4½	Melbourne 4½ p. c. Deb.	110—112	..	4 0 4
541,920	20	May 31	5	Monte Video, Ltd.	12½—13½	..	7 8 1
617,946	Stk.	Aug. 31	9½	Newc'tle & Gateah'd Con.	225—230*	..	4 0 5
264,855	Stk.	June 29	3½	Do. 3½ p. c. Deb.	106—109	..	3 4 3
				* Ex div.			

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
150,000	5	May 31	8	Oriental, Ltd.	7⅞—8	..	5 0 0
135,000	5	,,	8	Do. New, £4 10s. pd.	6½—7	..	5 14 3
15,000	5	,,	8	Do. do. 1879, £1 pd.	1½—1¾	..	4 11 5
60,000	5	Mar. 29	7	Ottoman, Ltd.	5½—6	..	5 16 8
500,000	100	June 1	6	People's Gas of Chicago 2nd Mtg. Bonds	102—106	..	5 13 2
851,070	10	Apl. 27	7	River Plate Ord.	11¼—11⅝	..	5 19 2
250,000	Stk.	June 29	4	Do. 4 p. c. Deb.	100—102	..	3 18 5
250,000	10	Mar. 29	10	San Paulo, Ltd.	16—17	..	5 17 8
135,000	Stk.	Mar. 29	10	Sheffield A.	244—249	..	4 0 4
209,053	,,	,,	10	Do. B.	244—249	..	4 0 4
447,427	,,	,,	10	Do. C.	244—249	..	4 0 4
5,600,000	Stk.	Aug. 16	5⅛	South Metrop., 4 p. c. Ord.	140—143	..	3 14 7
1,520,000	,,	July 13	3	Do. 3 p. c. Deb.	101—103	..	2 18 3
120,000	Stk.	Aug. 31	6	Tottenham and Edmonton A. 5 p. c. B. 2½ p. c. 4 p. c. Deb.	141—143*	..	4 3 11
250,520	,,	,,	4½		102—104*	..	4 6 6
55,100	,,	—	4		115—120	..	3 6 8
182,380	10	June 15	5	Tuscan, Ltd.	9—10	..	5 0 0
149,900	10	July 3	5	Do. 5 p. c. Deb. Red.	98—100	..	5 0 0
				WATER COMPANIES.			
146,184	Stk.	June 29	11	Chelsea, Ord.	313—318	..	3 9 2
150,000	,,	,,	5	Do. 5 p. c. Pref.	167—170	..	2 18 10
160,000	,,	,,	4½	Do. 4½ p. c. Pref. *75	148—153	..	2 18 10
175,785	,,	Mar. 29	4½	Do. 4½ p. c. Deb.	156—160	..	2 16 3
1,720,560	Stk.	Apl. 13	7	East London, Ord.	208—213	..	3 5 9
654,740	,,	June 29	4½	Do. 4½ p. c. Deb.	155—158	..	2 17 0
390,000	,,	,,	3	Do. 3 p. c. Deb.	101—103	..	2 18 3
700,000	50	June 15	7½	Grand Junction 10 p. c. max. 4 p. c. Deb.	171—174	..	3 5 9
310,000	Stk.	Mar. 29	4		135—140	..	2 17 2
708,000	Stk.	Aug. 16	14	Kent	358—363	..	3 17 2
160,000	,,	,,	7	Do. New, 7 p. c. max.	208—213	..	3 5 9
1,043,800	100	June 29	10½	Lambeth, 10 p. c. max.	298—303	..	3 9 4
406,200	100	,,	8	Do. 7½ p. c. max.	225—230	..	3 9 7
350,000	Stk.	Mar. 29	4	Do. 4 p. c. Deb.	135—140	..	2 17 2
500,000	100	Aug. 16	13½	New River, New Shares	430—440	+7½	3 1 4
1,000,000	Stk.	July 28	4	Do. 4 p. c. Deb.	135—140	..	2 17 2
902,300	Stk.	June 15	7½	South-wark and	Ord.	205—210	+2	3 11 5
126,500	100	,,	7½		7½ p. c. max.	193—198	..	3 15 9
489,200	Stk.	,,	5		5 p. c. Pref.	167—172	..	2 18 2
1,019,585	,,	Apl. 13	4	Vauxhall	4 p. c. A Deb.	135—140	..	2 17 2
1,155,066	Stk.	June 15	10	West Middlesex		200—205	..	3 5 7
200,000	,,	,,	4½	Do. 4½ p. c. Deb.		154—158	..	2 17 0
200,000	,,	Mar. 10	3	Do. 3 p. c. Deb.		102—104	..	2 17 8
				* Ex. div.			

very day from Llysfaen and Colwyn Bay as to the higher levels. The otal expenditure on these mains was £9401. There was an arbitration n respect of the mains; and it was decided that part of them was to be vested in the Joint Board, a portion in the Colwyn Bay and Colwyn District Council, and the other portion in the rural district of Conway. They were applying for a loan to cover the whole of the cost of the mains, because the Board had decided to do the work. The Inspector pointed out that the Board could not borrow on behalf of other authorities. Mr. Parry explained that they could not get sufficient water at Llysfaen; and the Board decided to borrow £9000 to carry the water through that district. The Conway Corporation, however, held that they were not liable for the cost of those mains; and, as a result, the question was submitted to arbitration. But the work had been half done by that time. The proportions of the award, made by the Engineer, were as follows: Joint Board, £1198; Colwyn Bay and Colwyn Council, £7119; and Conway Rural Council, £1103. The Inspector: So that for the payment of £1198 the Joint Board want to borrow £9000? Replying to Mr. Thornton Jones, Mr. Parry admitted that the Board persisted in the application for this £9000, notwithstanding the award and an order of the Queen's Bench enforcing the award. The Conway Corporation had protested both verbally and in writing against the Joint Board charging themselves with the liability of other of the constituent authorities. Mr. T. B. Farrington, the Engineer to the Board, explained in detail the expenditure connected with his department; and witnesses were called to give evidence as to the state of the water supply in various parts of the district. The Inspector intimated that he would have to go into further details with the Engineer.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Gas and Electric Light accounts of the Aberdeen Corporation, a summary of which was published last week, were submitted at a meeting of the Town Council on Monday by Councillor Kemp, the Convener of the Committee, who said that on gas and meter rents, residual products, house services, and gas-stoves, there was practically an increased profit of £93. The aggregate expenditure on net revenue account was £751 more than last year; and, adding a balance of £4138, the amount in hand was now £10,000. The capital account had risen by £5603, principally on account of new mains and additional meters. The reserve and fire insurance fund was £21,624; and the total of the sinking and contingent funds was £95,843. The gas produced for the year was over 530 million feet, or 36 millions more than last year. The estimates for 1899-1900 were based on an estimated increase of gas to be sold of some 12 million cubic feet, and also on an expected increase from the sale of secondary products to the extent of some £1360. The Committee also based their estimate on 3s. as the price of gas during the current year; being a reduction of 1d. per 1000 cubic feet. In ordinary circumstances, the Committee would have felt justified perhaps in making a still greater reduction; but they had to remember that some time ago the old Committee had to fix contracts for coal at an increase in price of some £5500, and that, in addition to this, they also raised the wages bill of the employees to the tune of some £500 per annum. This increased expenditure of about £6000 represented nearly 3d. per 1000 cubic feet of gas; so that the present Committee had undertaken to face 1d. reduction in price alongside of an increase in costs of nearly another 3d. Turning now to the electric light accounts, it would be seen that at the end of last year they had borrowed £44,068; and at July 31 of this year the amount borrowed stood at £66,811. They had redeemed £3078; leaving the loan account at £63,733. The sinking fund had been increased during the seven months by about £900, and now stood at £3078. At the beginning of this year, buildings, machinery, instruments, mains, services, &c., stood at £61,778. They had written off £1107 as depreciation for seven months, and increased the plant by £9042—making the total holding under this head £69,713 on July 31 last. The revenue was £4804 for seven months, as against £5707 for twelve months last year. The net balance for seven months on the working account was £2723, as against £3111 for the twelve months of last year. There was, after deductions for interest, sinking fund, &c., a net shortcoming of revenue as against the expenditure on seven months of £203. This was by no means a surprising result, seeing that they were dealing practically with the three summer months—May, June, and July—when there was the very minimum of demand with the maximum of charge for interest and depreciation. During the first seven months of this year, there had been an increase over the output of last year amounting to some 36 per cent. He moved the adoption of the accounts; and this was agreed to.

The Corporation of Glasgow are about to inaugurate a great change in their arrangements for the furnishing of light for public and private streets and common stairs. A minute by the Watching and Lighting Committee was submitted at a meeting of the Police Department of the Corporation on Monday, which stated as follows: "In the event of the Corporation resolving to materially extend the lighting by electricity of the public streets of the city, and in view of the great expense likely to be incurred by the adoption of such resolution to extend the electric lighting of the city, the cost of such lighting be defrayed by assessment, imposed equally upon proprietor and occupier, and, further, that the whole cost of providing for, maintaining, and supplying the lighting of the remaining public streets, as also the private streets, private courts, and common stairs, be defrayed by assessment, imposed equally upon proprietor and occupier; and that, on such resolution to extend the electric lighting being adopted by the Corporation, it be remitted to the Parliamentary Bills Committee of the Corporation to take steps for having parliamentary sanction given to the recommendations *quoad* assessments contained in this minute, as also to any statutory authority that may be required to enable the use of electric lighting in lieu of gas in common stairs." The working of the proposed arrangement was explained by Mr. Oatts, who said that the cost of lighting the public streets at present amounted roundly to £30,000 per annum. This was thrown upon the streets rates, which were paid by the occupiers alone. The cost of lighting private streets and common stairs amounts to about exactly the same sum per annum—

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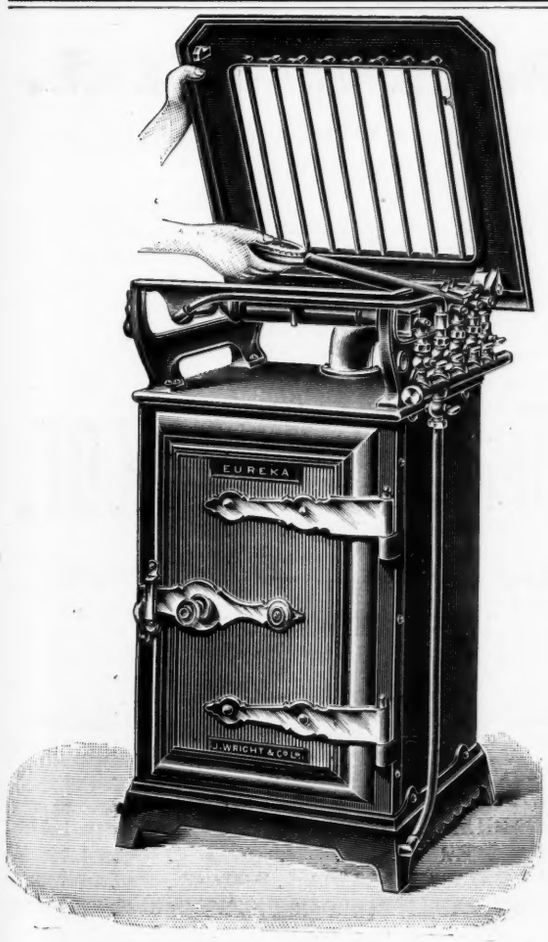
namely, £30,000. The latter expenditure was met by fixing a charge, not exceeding 10s. per burner, on stair lighting, which was recovered from the proprietor; but the latter, on the other hand, had the right to charge the occupier with the amount disbursed by him—getting from the Corporation 20 per cent. of the rate for his trouble in collecting. But 10s. per burner produced only £18,000 per annum; and the balance, amounting to about £12,000, was thrown upon the occupier, just as was done in the case of the public lighting of the streets. The question the Committee faced was: Is there any good reason for changing the mode of lighting the common stairs of the city? The Committee very cordially adopted the recommendation of Mr. Henry; and he thought he could not do better than read what Mr. Henry had said on the point: "Why should a working man who enters his dwelling-house by a door on any of the flats in a common stair in a property in Garscube Road, pay more lighting assessment than the merchant who enters his house by a main door in Blythswood Square? The merchant in Blythswood Square has his pathway home from any corner of the city on a dark night made bright by the public lamps on the streets, the expense of which is paid out of the public purse; and why should the working man living in Garscube Road not have his pathway to the door of his house, although it may enter from a common stair, made as bright out of the same purse?" The Committee had accepted that reasoning as sound; and if they were right in arriving at the conclusion that the lighting of common stairs should be carried to the category as part of the public streets, the next question they had to consider was whether they could alter the incidence of the tax. They felt that, in all fairness, the whole of this question of lighting public and private streets and courts should be dealt with by an assessment imposed equally upon owner and occupier. They were fortified in coming to this conclusion by the fact that during the last 20 or 25 years all assessments which have been laid on under Acts of Parliament had been laid on the principle of sharing between owner and occupier. The minute was adopted without discussion. At the same meeting it was resolved, by a very large majority, to proceed with an extensive addition to the electric lighting of the public streets. All-night arc lamps are to be charged by the Electricity Committee at the rate of £14 per annum. The extensions, when completed, will entail an additional charge upon the rates of about £4000 a year, equal to ¼d. in the pound. In the course of the discussion upon the recommendation of the Committee, Bailie Fife expressed the hope that more might be done with the lighting of subsidiary streets by the present illuminant. It was time, he considered, that the present antediluvian tin-top lanterns were done away with. Mr. Primrose, the Convener, said that the question of improved gas lighting had not been for a moment absent from the minds of the Committee. Mr. Hamilton (the Inspector of Lighting) had been engaged in an exhaustive series of experiments with incandescent gas-lamps.

In the Bill Chamber of the Court of Session yesterday, Lord Stormonth-Darling had under consideration an action of suspension and interdict by Robert Irvine, Director and Consulting Chemist of A. B. Fleming and Co., and residing at Caroline Park House, Royston, Granton, against the Edinburgh and Leith Corporations Gas Commissioners. Interdict is asked against the respondents (1) conducting blasting operations in connection with the erection of a gasholder on ground adjoining the complainer's house; and (2) against their conducting blasting operations in such a manner as to cast upon the complainer's house or garden or grounds, or upon a private path adjoining the house, stones or pieces of rock or other missiles. The Gas Commissioners have, for some months past, been engaged in cutting out foundations for a gasholder, and have had recourse to blasting operations, which, the complainer says, have injured, and are calculated to injure, his property, and are fraught with serious danger to him and to the other occupants of his house, as well as to those who have occasion to go to his house or grounds, or to use the road forming its western boundary. His Lordship granted interim interdict in terms of the second alternative conclusion of the prayer of the note.

I had a note about the Banff Gaslight Company a fortnight ago. I find that the Company have now consolidated their position by acquiring an inalienable feu title to the site of their works. These are built on the foreshore, which is the property of the Corporation. Hitherto the Company have occupied the space which, in the beginning, they found a rocky spur, washed by the sea waves, and upon which they erected substantial buildings, at the pleasure of the Town Council, to whom they have been paying a ground rent of £1 13s. yearly. A new gasholder is required; and the Company approached the Corporation with a proposal to acquire an additional area of 583 square yards of rock. The negotiations have resulted in an agreement which is very much to the advantage of the Company. The new space is given them; and then the whole area which they occupy is conveyed to them, absolutely and irredeemably, at a feu-duty calculated at the rate of £10 per acre. This works out to an annual payment of £3 13s. The agreement was ratified by the Town Council on Tuesday.

Gas in Lerwick is charged for at the rate of 7s. 6d. per 1000 cubic feet. Such a high price is a source of temptation to promoters of electric light schemes; and there need be no surprise, therefore, that a proposal has already been made for the introduction of electricity into the burgh. The Commissioners on Tuesday considered a report by an Engineer (Mr. Yorke), who recommends that the surplus water from the town water supply should be utilized for the driving of turbines. Mr. Yorke finds that a fall of 220 feet can be obtained; and he suggests the laying of a 16-inch pipe for 2000 yards, to convey the water to the turbines. The total cost of the installation he estimates at £1760, and the apparent yearly profit at £760—which is certainly a very wonderful return. His estimate is based on the price of current being 6d. per unit.

On Tuesday night of this week, an installation of electric lighting which has been constructed by the Corporation of Paisley was inaugurated with very little ceremony. Though only now brought into use, the installation is intended, in some way, to be a commemoration of the Diamond Jubilee of Her Majesty the Queen, and every lamp-pillar bears the date 1897. There are 64 public lamps, which is a good beginning for the town. The current is sent out at 2000 volts, and is transformed to a pressure of 200 volts. The plant is equal to a demand of 12,000 lamps of 8-candle power. The charge for current is to be on the Brighton system—7d. per unit for the first hour, and 3d. per unit thereafter.



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CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 9.

Sulphate of Ammonia.—The tone of the market is weak; and there has been a further decline in values—the closing quotations being £12 to £12 3s. 9d. per ton, delivered f.o.b. at the ports. Available supplies have only been moderate. But the mind of producers is altogether against holding; and to place current production, declining prices have had to be accepted. There has been a good inquiry. But the weakness of the forward market has reflected itself upon prompt; and, although there are large requirements to be covered, buyers have postponed their purchasing for immediate delivery to the last moment, and have for the most part refused to operate for the month and for October unless at a further decline in prices. In the forward position, London quotation has been reduced to £11 15s. per ton, Beckton terms, October-March delivery; and this has given encouragement to "bear" operations over the same period.

Nitrate of Soda is steady at 7s. 7½d. per cwt. for good, and 7s. 9d. per cwt. for refined, quality, on spot.

LONDON, *Sept.* 9.

Tar Products.—A little more activity is manifest in this market. The value of pitch is maintained; and shipments will now shortly re-commence. There are more inquiries; but buyers fight shy of prices quoted by makers. Benzol is steady, with a full inquiry from colour makers and for gas enrichment. Common tar oils show a considerable variation in value in different parts of the country. But, generally speaking, they are in fair request; and although the make is now increasing, it is hoped the better prices will be continued.

Average values of the week may be taken at: Tar, 16s. to 25s. 6d. Pitch, east coast 34s.; west coast 32s. Benzols, 90's 8d.; 50's 9½d. Toluol, 1s. 2d. Solvent naphtha, 1s. 2d. Heavy naphtha, 1s. 1d. Crude, 30 per cent., naphtha, 3½d. to 4d. Creosote, 3¾d. Heavy oils, 62s. 6d. Carbolic acid, 60's 2s.; 75's 2s. 6d. Creosote salts, 52s. 6d. Anthracene, nominal, "A" 3¾d.; "B" 2¾d.

Sulphate of Ammonia.—A somewhat dull market, emphasized by the indifference of makers, who have no stocks, marks the week just closing. £12, less 3½ per cent., may be taken as the average value at all ports.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Generally business in the coal trade of this district continues to move on steadily, with a very firm tone as regards prices; but no actual upward move has as yet been officially put in operation. A meeting of the Lancashire Sales Association is, however, to be held next Tuesday, when the question of some advance will be considered, and no doubt decided upon. With the holiday stoppages in the manufacturing districts now practically over, the demand for other classes of fuel for trade purposes is getting back into its normal condition; and there is an active inquiry all round, with prices strong, and tending to harden—especially on forward delivery. At the pit, average quotations are about 11s 6d. to 12s. 6d. per ton for best Wigan Arley, 10s. to 11s. for Pemberton four-feet and seconds Arley, 9s 6d. for common house coal, 8s. 9d. to 9s. 3d. for steam and forge coals, 6s. 9d. to 7s. 3d. for best slack, 6s. to 6s. 6d. for medium, and 5s. to 5s. 6d. for common sorts. Shipping is fairly good, and has not so far been in any way appreciably affected by the attempted strike of the Seamen's Union. Prices are without quotable change; averaging about 9s. 6d. to 10s. per ton for steam coal, and 11s. to 11s. 6d. for seconds house-fire qualities, delivered at the Mersey ports.

Northern Coal Trade.—There is a weakening in the steam coal trade; the chief requirements of the Northern ports having now been met. But the demand is increasing for Durham coals. For best Northumbrian steam coals, the rate is now 12s. per ton f.o.b.; and for steam smalls the price ranges from 6s. 6d. to 6s. 9d. per ton—the latter quality being rather scarce. Manufacturing coals are firm, and not too plentiful; the demand being a very full one. In the gas coal trade, there is a steady demand, which is beginning to increase satisfactorily, so that the collieries are now very fully at work to meet the larger requirements that are being made upon them. The prices generally quoted for best Durham gas coals vary from 10s. to 10s. 6d. per ton f.o.b.; but the bulk of the deliveries are at considerably lower prices. In the coke trade, there is a steady demand, and that at good prices, which helps the gas coke trade. Gas coke is being freely shipped, and with the local consumption the output is well taken up. The quoted price is 14s. per ton f.o.b.

Scotch Coal Trade.—There is no change in the condition of the coal trade. Outputs are being readily disposed of, and the collieries are working full time. Splint remains firm, and ell of the better sorts is scarce. The prices quoted are: Main 9s. to 9s. 3d. per ton f.o.b. Glasgow, ell 9s. 9d. to 10s. 6d., and splint 10s. to 10s. 3d. The shipments for the week amounted to 185,398 tons—a decrease upon the previous week of 22,151 tons, and upon the corresponding week of last year of 57,841 tons. For the year to date, the total shipments have been 5,854,014 tons—a decrease upon the corresponding period of last year of 751,488 tons.

Proposed Concessions to Gas Consumers at Sowerby Bridge.—The Gas Committee of the Sowerby Bridge District Council are proposing to make some considerable concessions to their customers. At the next meeting of the Council, the Chairman of the Committee (Mr. J. W. Lodge) will propose that the price charged outside the urban district be reduced to 3s. per 1000 cubic feet, and to 2s. 2d. within; that all preferential discounts be abrogated as from Oct. 1, and a uniform discount of 10 per cent. be allowed to all consumers whose accounts are paid within 28 days; and that the prices charged for cottage gas-meters as rent be reduced to 1d. per light per quarter, as follows: A two-light meter to be reduced from 2s. to 8d. a year, a three-light from 3s. 8d. to 1s. a year, and a five-light from 3s. 4d. to 1s. 8d. a year.

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BIRKENHEAD	2,250,000
SWINDON (New Swindon Gas Co.)	120,000
SALTLEY WORKS, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR STREET WORKS, BIRMINGHAM (Second Contract)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA	250,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
TORONTO (Second Contract; Remodelled)	2,000,000
BELLEVILLE	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.,	300,000
CRYSTAL PALACE DISTRICT	2,000,000
DULUTH, MINN.	300,000
CATERHAM	150,000
LEICESTER	2,000,000
ENSCHEDE (HOLLAND)	150,000
BUENOS AYRES (RIVER PLATE CO.)	700,000

And Additional Work, including complete Gas-Works at Nelson and Rossland, British Columbia.

Milton-next-Sittingbourne Water Supply.—The threatened water famine at Milton-next-Sittingbourne has been averted by the Urban District Council deciding to pay their proportion of the cost of obtaining the auxiliary supply.

The Improved Public Lighting at Newmarket.—On Friday, the 1st inst., the new system of public lighting by incandescent gas-burners, which has been carried out at Newmarket by the Gas Company, was inaugurated. The change, which has been effected under the supervision of the Company's Engineer and Secretary (Mr. J. H. Troughton), gives five times more light in the district for nearly £100 less than the former charge; so that the inhabitants should have reason to be satisfied at the result of the recent competition for the lighting contract.

The Price of Gas at Silsden.—At the last meeting of the Silsden District Council, a discussion took place on a proposal to allow a special discount on the price of gas used for manufacturing purposes. The proposal was to allow 1d. per 1000 cubic feet off 100,000 feet and ½d. per 1000 for each additional 100,000 feet. Several members thought the Council could not afford to do this; and the general opinion seemed to be that no extraordinary discount should be allowed, but that all should be treated alike. A question also arose as to whether public-houses, chapels, &c., were to be included under the head of "manufacturing purposes." Ultimately the Chairman (Mr. C. Weatherhead) proposed that an extraordinary discount be allowed to all consumers of more than 100,000 cubic feet, to be used for any purpose; and this was carried. A sliding-scale was also approved. A further proposal that the highest discount allowed be 10 per cent., instead of 12½ as put forward, was adopted.

Tonbridge Gas Company.—The half-yearly meeting of this Company was held on Monday, the 28th ult.—Mr. J. Fagg in the chair. The Directors reported that there had been a steady increase in the consumption of gas, and that the new plant at the works was completed and working satisfactorily. The Provisional Order, as passed by the Board of Trade, had received the Royal Assent; and contracts had been entered into for extending the mains to Hadlow and Hildenborough. This work had been already commenced. The Directors had decided to dispose of £2000 of new stock to meet the expenses of extending the mains and plant. The Manager and Secretary (Mr. J. Donaldson) reported that the works and plant were in a satisfactory condition. In moving the adoption of the report, the Chairman congratulated the shareholders on the successful half year the Company had had. An increase in the price of coal had absorbed a considerable amount; but still they could show a balance of profit practically the same as that for the corresponding period of last year. They were able to pay their full statutory dividend, and carry forward a considerable sum. The profit for the half year was £1632, which, added to the balance from the previous account, made £4857 available for distribution. The report was adopted; and dividends at the rates of 11½, 8½, and 5 per cent. per annum were ordered to be paid. A hearty vote of thanks was accorded to the Chairman and Directors for their careful management of the undertaking; a similar compliment being paid to the Secretary and Manager.

Inequality in the Sale of Coke.—In moving the adoption of the minutes of the Gas Committee at the meeting of the Sowerby Bridge District Council last Wednesday, Mr. J. W. Lodge had some remarks to make on the question of the price of coke. He said that, when he suggested two months ago that the price of coke should be raised, he received a "sound thrashing" for having introduced such a proposition. They were supposed to be selling their coke at the same price as Halifax—7s. 6d. per ton; and yet a lot of the coke was being carted to Halifax under an arrangement with a contractor at the rate of 5s. 3d. per ton, which was 2s. 3d. less than the price charged to the general public. This contractor was thus enabled to sell the coke at the gates of the Halifax Gas-Works at a less rate than was charged by Halifax. Consequently, Halifax had to go farther afield; and he noticed they were selling the coke in one case at the rate of 8s. 5½d. per ton. He suggested that a combination of local authorities would be able to accept such contracts, and guarantee a ship-load.

Further Changes at the Longton Gas-Works.—At Thursday's meeting of the Longton Town Council, the Sub-Committee appointed to consider the revision of the office work and staff at the gas-works reported that they had come to the conclusion that the services of a collector and cashier were no longer required, and that the work could be satisfactorily carried on with an additional clerk. Mr. G. E. Farmer, the head clerk at the works, had tendered his resignation; and the Sub-Committee had appointed two office clerks "at a salary of 25s. per week each." Alderman Farmer took exception to the action of the Committee, particularly with regard to dispensing with the services of Mr. G. T. Platt, who, he said, had been collector for something like seventeen years, was of unblemished character, and a man whose integrity no one could question. He found still more fault with the way in which this was done, which, he said, was not courteous. He also took exception to what he described as practically the forced resignation of his son, Mr. G. E. Farmer. These proceedings were derogatory to the Council; they were not manly, and they were not just. He described recent affairs with regard to the gas undertaking as a fiasco, inasmuch as nothing but progress had been shown to be going on at the works. There had been a special inspection of the works, and the gentlemen who made it described them as "model works." There had also been a special audit; and the Auditors expressed their opinion that never were the books in a more forward or creditable state. Alderman Bakewell (Chairman of the Committee) claimed that there had been no discourtesy shown to anyone. With regard to Mr. Platt, his work as collector was almost done away with when they commenced to give discount for cash at the office, and when they appointed some time ago a Secretary and Cashier. There was really no work commensurate with his salary and abilities left for Mr. Platt to do. Mr. Platt thought he was entitled to a pension; but he (the Chairman) told him that that was not for the Committee to consider, but for the Council, and so it was. With regard to Mr. Farmer, the Committee did not know until they received his resignation that he intended to resign his position; and it had not been their wish to lose his services. The report of the Committee was passed.

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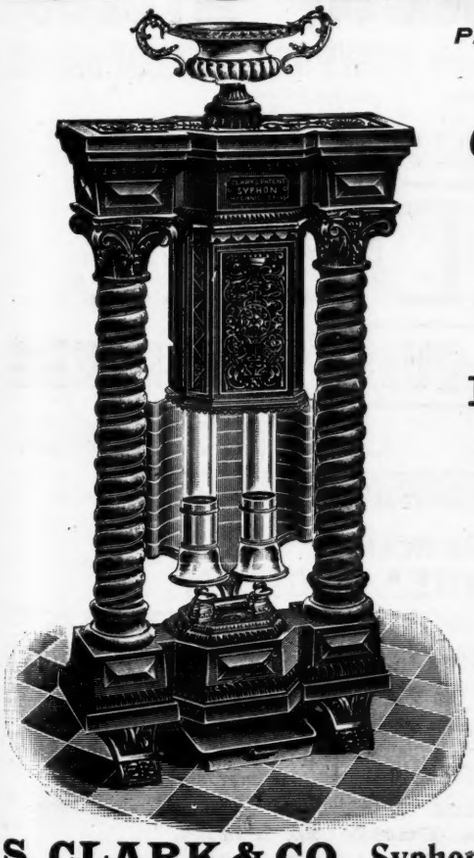

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Accident at the Ashford Gas-Works.—An unfortunate accident occurred at the Ashford Gas-Works last Thursday week. A mechanic named William Johnson was on the scaffolding connected with the building of a new gasholder, when he fell into the tank, a distance of about 20 feet. He was removed to the Cottage Hospital, where it was found that the poor fellow had both thighs broken.

The Hours of the Pipelayers of the Leeds Corporation Gas Department.—The men employed in the pipe-laying department of the Leeds Corporation Gas-Works have conditionally agreed to give a three months' trial to the Committee's offer of an eight-hour working day; the concession being accompanied by conditions as to walking time, &c. In temporarily accepting the proposal, the men will ask the management to remedy any grievance that might arise under the new system.

Explosion of Gas.—An explosion of gas, by which Mr. William Hill and his wife were severely injured, occurred at Handsworth, Birmingham, early last Friday morning. A strong smell of gas pervaded the house, and they came down to ascertain the cause. They opened the doors and windows, and, after waiting about 20 minutes, lighted a candle with the object of examining the meter. Immediately there was an explosion, which blew out the windows and doors, and did considerable damage. Mr. and Mrs. Hill were very badly burnt, and had to be taken to the hospital.

Expansion of the Business of the Bangor Corporation Gas Department.—In the course of the proceedings at the meeting of the Bangor City Council last Wednesday, the Mayor (Alderman J. E. Roberts) called attention to the marked increase in the business of the Gas Department during recent years. In 1880, he said, they had only 145 public lamps; now they had 297, or more than double. The department had made great strides, too, in supplying the public with cooking-stoves. In the first three years, they were only able to let out two or three stoves; now they had 122 in use. The meters in use were a few years ago 516; they now nearly doubled this number—amounting to 997.

Issue of New Stock of the Swansea Gas Company.—Mr. Ernest Leeder (of Messrs. J. M. Leeder and Sons) sold by auction at Swansea last Tuesday, £20,000 of new ordinary 5 per cent. stock and £6000 of 3½ per cent. perpetual debenture stock of the Swansea Gas Company. Before offering the stock, it was mentioned by Mr. Leeder that, during the past twelve months, the Company had had an increase in the consumption of gas equal to 9 per cent., as a consequence, chiefly, of the large number of coin meters that had been fitted. Somewhere about £12,000 had been, or was being, spent in the extension of the works; and foreseeing still further extensions, the Company had acquired a very important freehold property—the Vetch Field—for the purpose of still further extending the works. The first ten lots of £100 of new ordinary stock sold for £123; but bidding was rather slow after this, and prices varied between £121 and £122. The £6000 of 3½ per cent. perpetual debenture stock fluctuated between £102 10s. and £100 10s. per cent. The total amount realized by the sale was £30,178, or an average on the debenture stock of £101 3s. 4d. per cent., and on the new ordinary stock of £120 10s. 10d.

Ottoman Gas Company, Limited.—The accounts to be presented at the half-yearly meeting of this Company on the 19th inst. show that the gas-rental in the six months ending the 30th of June amounted to £8869, as compared with £8995 in the corresponding period of 1898; and that the net profit, after deducting the debenture interest, is £2200. The amount standing to the credit of the profit and loss account is £3086, out of which the Directors recommend the payment of a dividend at the rate of 7 per cent. per annum on both classes of shares. This will absorb £2625, and leave £461 to be carried forward.

A Stafford Town Councillor and the Corporation Gas Engineer.—Some few weeks ago, Mr. Blackman, a member of the Stafford Town Council, in the course of a heated debate made some remarks as to the gas and electric lighting of the town, which the Engineer (Mr. J. Ferguson Bell) considered to be a reflection upon the manner in which he discharged his duties. Mr. Bell thereupon commenced an action for libel against Mr. Blackman. The latter has now apologized, and made a declaration to the effect that he did not intend any reflection upon the Gas Engineer's character for strict probity and honour. So the matter is happily settled. Mr. Bell has, in the opinion of the Council and the inhabitants of Stafford, served the borough well and faithfully; and this termination of an extremely unpleasant incident has given general satisfaction.

Burnley Gas Supply.—At the monthly meeting of the Burnley Town Council last Wednesday, it was unanimously decided to apply to the Local Government Board for sanction to borrow £25,000 for the provision of carburetted water-gas plant, the enlargement of the gasholders, and the purchase of cooking and heating stoves, &c. Mr. Emmott explained that it was absolutely necessary that the gas plant should be extended as soon as possible, because that at present in use was hardly sufficient to meet the demands likely to be made upon it during the coming winter. In the five months ended the 25th of August last, the augmentation in the consumption was 15 per cent. on the corresponding months of the preceding year; and if the increase in December exceeded by 10 per cent. that of last year, the plant would be taxed to its fullest capacity. It is intended that the proposed new works shall be ready next July or August.

Proposed Incandescent Lighting for Southwark.—At the meeting of the St. Saviour's, Southwark, District Board of Works last Wednesday, a member drew attention to the fact that an offer from the South Metropolitan Gas Company with respect to the introduction of incandescent lighting had been referred to the Surveyor some time ago. He said it was time they had a report, as the proposal seemed a most advantageous one, inasmuch as, while it would reduce the gas bill by about 15 per cent., the increase in the illumination of the streets would be very great. Mr. Castle said, as a member of the Camberwell Vestry, he could speak with some authority upon this matter. The offer of the Company to the Vestry, which was identical with that made to the Board, had been accepted some months ago, and the results had been in every way most satisfactory. The Surveyor (Mr. G. R. Norresh) promised to bring up a report at the next meeting.

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TAR-BURNERS. ROOFS. GIRDERS, &c., &c.

Makers of Cripps' Patent Grid Valve and Hydraulic Main Valve.
Makers of Holgate's Patent Gas-Purifying Plant.
Makers of Tysoe's Patent Self-Sealing Mouthpiece.

Acetylene Gas Lighting at Tenterden.—The church at Tenterden has now been lighted by acetylene gas, which is also in use in the streets of the village.

Sevenoaks Water Company.—Addressing the shareholders at the recent meting of this Company, the Chairman (Mr. David Reid) said he wished to express the Directors' satisfaction at being able to record continued progress. The receipts from all sources, as compared with the corresponding period in 1898, showed an improvement of £240. With the amount brought forward, there was an available surplus of £1547; and, after distributing dividends at the rate of 9 per cent. per annum on the consolidated stock and £6 6s. per cent. per annum on the share capital, together amounting to £1214, there was a balance left of £333. There had been an increase of £884 in the capital expenditure. This outlay had been occasioned by necessary extensions of the Company's mains, all reproductive, and by important underground works for water storage. The report was adopted.

Loughborough New Water-Works.—The Loughborough Town Council made their annual inspection of the water-works last Wednesday; and the occasion was marked by the opening of a new filter-bed at the Nanpantan works by the Mayoress. When the reservoir was first constructed there, three filter-beds were laid down, a fourth was subsequently added, and it has now been found necessary to make another one. The new bed measures 65 feet by 55 feet, and is 8 feet deep. It is composed of 9 inches of ½-inch gravel, 3 inches of pea gravel, and 3 ft. 6 in. of sand—about 700 tons of material in all. The sand consists of four parts of Nottingham rock and one part of Trent; the sand in the old beds being entirely of Trent. The cost of the new bed has been £1400; and it will filter 172,000 gallons per day—its holding capacity being 156,000 gallons. It is calculated that, when the Blackrock scheme of the Corporation is completed, they will have a water supply for a population of 100,000.

East Ardsley Gas Company.—The Company have had troublous times for some years; and their prospects are no brighter. The balance of profit last half year, including the sum brought forward, was only £280; and in consequence of the large expense which will be incurred in renovating an old gasholder tank (£300), the Directors could not, at the recent meeting, recommend the declaration of a dividend. On the adoption of the report and accounts being moved by the Chairman (Mr. H. Waterhouse), considerable discussion took place in regard to the working and position of the undertaking. The gas sold showed an increase of only £70; but the extra cost of coal, lime, wages, &c, absorbed this. The yield of gas per ton of coal carbonized had also been less than the average—due to an inferior supply on a contract which had now ended. The leakage, owing to subsidence from colliery workings, had also been large. In reply to a question as to what were the prospects of the Company, the Chairman could not say they were rosy, as the Morley Corporation had obtained power to supply West Ardsley, and their price was 2s. 4d. per 1000 cubic feet, as against the 3s. 9d. of the Ardsley Company. Alderman Roberts thought the Ardsley Council would naturally go to the cheapest place for gas for public lighting; but it was a question whether other people could supply private customers in a part of the Ardsley Company's area. The mischief was that they had only a Board of Trade authority, not an Act of Parliament. The Chairman thought it would be imperative on them to lower the price of gas, though not, perhaps, to the level of the Morley Corporation. The Secretary, in reply to a question, said that one-eighth of their income was in jeopardy. The report was adopted.

Water Supply in North Yorkshire.—The Easingwold Rural District Council have adopted a scheme for supplying water from the Hambleton Hills to ten villages in the district, containing an aggregate population of 3600. The cost of carrying out the scheme is estimated at £15,629. Mr. F. Graham Fairbank, of York, is the Engineer.

The Water Scheme for Cumberland Districts.—The scheme for supplying a large area in the Wigton, Aspatria, and Holme Cultram districts of Cumberland with water from Overwater and the upper reaches of the River Ellen, at a cost of about £30,000, was discussed at a meeting of the Wigton Rural Council last Tuesday, and met with considerable criticism. It was pointed out that a large portion of the Wigton district was neglected, and the meeting declined to appoint a Committee to proceed further.

Neath Water Supply.—At the meeting of the Neath Town Council last Thursday, Alderman H. P. Charles moved that the Water Committee consider the advisability of increasing the water supply of the town by securing the watershed at Neath Valley, and of inviting other district authorities to co-operate with them. He defended the Council from outside attacks, and denied that their new water supply was a failure. His motion was put forward simply to meet growing requirements, and to secure water which should naturally flow to Neath. The motion was agreed to.

The Supply of the Heywood and Middleton Joint Water Board.—The Heywood and Middleton Joint Water Board are short of water; and arrangements have been made for an auxiliary daily supply of 100,000 gallons from the Rochdale Corporation. The price is to be 1s. per 1000 gallons; and either party is to be at liberty to discontinue the supply at any time. The Board have also entered into arrangements with the millowners on the Naden Brook for a stoppage in the supply of compensation water every alternate day. This stoppage is attended by a heavy pecuniary payment to the millowners; and it is therefore to be hoped that the Board may soon be in a position to again deliver the full statutory quantity of compensation water.

Extravagant Consumption of Water at Keighley.—Owing to the rapidly diminishing condition of the supply, the Water Committee of the Keighley Corporation have caused a searching investigation to be made; and it is clear there is great waste going on somewhere. A few months ago a meter was put down to register the whole supply of water going into the town; and, at the outset, it showed a consumption of 50 gallons per head per day on an estimated population of 40,000. The steps which the Committee in consequence took reduced the consumption to 38 gallons per head; but as the trade consumption is equal to 3½ gallons per head, there are still about 35 gallons being used for domestic purposes. No defect has been found in the mains; and now a house-to-house inspection is to be made. The object of the Committee is to save consumption rather than have to immediately provide a new supply; but probably plans for additional works will be laid before the Council at an early date, so that they may be started in 1901.

The Lighting Corporation, Limited, have issued their new abridged illustrated catalogue for 1899-1900. The Corporation, it may be remembered, are the successors to the late Wenham Company; and the new list shows a large variety of high-power gas-lamps suitable for both indoor and outdoor lighting. A special feature of the Company's system is the combination of uniform illumination with efficient ventilation.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director,
160, 161, & 162, PALMERSTON BUILDINGS,
OLD BROAD STREET,
LONDON, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to the Company as above.

WINKLEMANN'S ORIGINAL "VOLCANIC" FIRE CEMENT and "VOLCUM" PASTE. Always ready for use in GAS-WORKS. Resists 4500° Fahr.

ANDREW STEPHENSON,
182, Palmerston Buildings,
Old Broad Street, E.C.
"Volcanism, London."

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS. Correspondence invited.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER LINCOLN."
[For Illustrated Advertisement, see Sept. 5, p. 618.]

AMMONIACAL LIQUOR wanted.
BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

SULPHURIC ACID.
JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

SPENT OXIDE wanted.
BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPECIAL PAINT FOR GAS-WORKS.
JOHN E. WILLIAMS AND CO.
VICTORIA PAINT WORKS,
MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1769.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

SEASON 1899.

BALE'S OXIDE OF IRON, of finest Quality. Summer delivery specially recommended for efficiency and economy.
FIRE CEMENT, PAINT, and CHEMICALS.
120 and 121, NEWGATE STREET, LONDON, E.C.

SADLER & CO., Ltd., Middlesbrough, Tar Distillers and Tar Colour Manufacturers. BENZOL specially prepared for Gas Enrichment free from Sulphur. Pure Hydrated OXIDE OF IRON for Purifying Gas either for Sale or Lent on Hire. Always Buyers of GAS TAR and AMMONIACAL LIQUOR.

CANNEL, COAL, ETC.
JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application to No. 30, ST. ANDREW SQUARE, EDINBURGH, or NEWTON GRANGE, NEWBATTLE, DALKEITH, SCOTLAND.

SULPHURIC ACID for Sale.
BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BENZOL, specially made for the Enrichment of Gas.
ELLISON AND MITCHELL, LIMITED, Kilnhurst, near ROTHERHAM.

GAS CARBON Wanted, not less than 4-Ton Loads.
Apply to the BRIMINGTON CARBON COMPANY, Sowerby Bridge, YORKS.

GAS TAR wanted.
BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SHEFFIELD CHEMICAL COMPANY, LIMITED.

BUYERS of Spent Oxide. Sellers of OXIDE OF IRON and SULPHURIC ACID.

PRACTICAL RETORT SETTERS.

BATES & NUTTALL, 32, Havelock Road, Saltley, Birmingham.
Regenerator or other Furnaces erected to Engineers' own Designs. Best Work Guaranteed. Please write for Estimates.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.
Before placing Orders, please write for Estimate.
Telegraphic Address: "SATURATORS, BOLTON."

MELROSE CYCLES

SHOULD be bought by Gas and Water Officials. Ladies' No. 1, £10 10s.; No. 2, £8 10s. Gents' No. 1, £10; No. 2, £8. Highest Quality. Twelve Months' Guaranty. Sent on approval. Catalogue free. MELROSE CYCLE COMPANY, COVENTRY.

PATENTS FOR INVENTIONS.
Messrs. J. C. CHAPMAN & CO., Chartered Patent Agents, ADVISE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

ECONOMY IN PURIFICATION.

INCREASE the efficiency of your PURIFIERS by adopting CRIPPS'S PATENT BYE-PASS VALVE in the lower Tiers of Sieves. Practical Experience proves their Economy. Engineers are repeating orders after thorough trial.
References and Particulars can be obtained from the Makers—
C. & W. WALKER, LIMITED, Midland Iron-Works, Donnington, near Newport, SALOP.

IRON OXIDE (Bog Ore), best quality, for the Purification of Gas, containing up to 85 per cent. Hydrated Oxide of Iron, and absorbing while being used a high percentage of Blue.
S. BOWLEY AND SON, Wellington Works, Battersea Bridge, LONDON, S.W.

GLOBE Chemical Works, Marple, near Manchester, Se'l the most reliable and best Continental, Irish, and English
OXIDE OF IRON for Purifying Gas. Purity and Quality guaranteed.
Sellers of the best RETORT CEMENT, and Buyers of SPENT OXIDE.

GAS-FITTER (good all round Man) wants Situation.
Gas, 47, Sycamore Road, Handsworth, BIRMINGHAM.

ADVERTISER seeks re-engagement as SERVICE LAYER. Fifteen years' Experience Well up in Main Work, Fitting, &c.
Address No. 3336, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a re-engagement by a Gas Engineer who has had Fifteen Years' practical Experience as ENGINEER and MANAGER. Willing to take position at Home or Abroad. Age 37.
Address No. 3339, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ADVERTISER seeks position as COLLECTOR or CLERK and COLLECTOR to Gas or Water Company. Thorough knowledge of Office routine and Secretarial work. Highest References.
Address No. 3334, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ADVERTISER (age 33) requires Situation as WORKING MANAGER of a small Works, or FOREMAN on a medium-sized Works. First-class References.
Address No. 3345, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ADVERTISER (age 22) requires Situation as ASSISTANT, or a position of trust in a medium-sized Gas-Works. Seven Years' practical Experience. Honours Certificate City and Guilds Examination in Gas Manufacture. Highest References. No objection to going Abroad.
Address No. 3338, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a re-engagement as Engineer and MANAGER of Gas-Works (or would accept position as Assistant). Has had considerable experience in the Construction and Re-construction of Plant, working of Stoking Machinery, &c., and erecting and working Plant for the Distillation of Tar and Ammoniacal Liquor. Willing to go Abroad.
Address No. 3340, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

A GERMAN Firm desires to form CONNECTION with an ENGLISH MANUFACTURER of SELF-LIGHTERS or SELF-LIGHTING APPARATUS of English make for Incandescent Lighting. Sample order would be given forthwith. Self Incandescent Mantles and German made Articles will not suit.
Illustrated Catalogues with Prices invited to "S.Z. 8119," care of Rudolf Mosse, Stuttgart, GERMANY.

WANTED, immediately, two Under STOKERS (Shovel). Wages 26s.
Apply to C. V. BENNETT, Engineer and Secretary, Gas-Works, FELIXSTOWE.

AN opening is offered to a Fitter who is seeking to qualify as WORKING MANAGER of small Gas-Works.
Apply, by letter, to No. 3346, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, immediately, a Young Man as STOKER, and willing to make himself useful. Wages 18s., with good House, Coal, and Gas.
Apply, stating Age and References, to A. E. BUCKLEY, Manager, Gas-Works, COBRIDGE.

WANTED, an Under Man for Charging, Purifying, and to make himself generally useful in a small Gas-Works. Wages 24s. per week.
Apply, by letter, with *copies* of Testimonials, to Mr. JAMES COWNEY, Gas-Works, Seaford, SUSSEX.

WANTED, a Draughtsman, accustomed to Gas-Works Plant.
Apply, stating Age and Salary required, and giving Reference to last Employer, to NEWTON, CHAMBERS, & Co., LIMITED, Thorncliffe Iron-Works, near SHEFFIELD.

WANTED, a Draughtsman (Age about 25 years). One acquainted with Gas Manufacture, Sulphate Plant Working, &c., preferred. Salary £100 to £125 per annum.
Apply, by letter, to No. 3344, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Working Foreman Lamp-LIGHTER for a Gas-Works about 20 miles from London. One used to Incandescent Lighting, and with a knowledge of Fitting, preferred. Wages 24s. per week.
Apply, by letter, stating Age, &c., to No. 3342, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a first-class Foreman Retort SETTER for a large Gas-Works. Must be accustomed to the control of Workmen, also be able to adjust and regulate Heats of Retort-Settings on both Direct and Regenerative Systems of Firing. He must be able to read and set out work from Drawings. None but experienced and steady Men need apply. Wages 45s. per week of six days.
Apply, by letter (with *copies* of Testimonials), stating Age, to No. 3341, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a really efficient and reliable HEAD CHEMIST. One who is methodical in his ways, and accustomed to the routine of Iron and Steel Works. A man who has a taste for original work, and is accustomed to the Analysis of Gases, the determination of the Calorific Values of various Substances, and the Microscopic Examination of Iron and Steel, will have the preference. Salary to begin with £200 per year.
Apply, by letter, stating Experience and Qualifications, to No. 3343, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TEIGNMOUTH URBAN DISTRICT COUNCIL.

WANTED, immediately, a competent GAS MANAGER to take entire charge of the Teignmouth Gas-Works, Mains, Services, and Meters. He must have a practical knowledge of the Manufacture of Gas, Sulphate of Ammonia, and all Residuals. The annual make of Gas is about 23 million cubic feet. House and Gas will be provided.
Applicants must state Salary, also Particulars as to Age, and present or last employ.
Applications, by letter, with not more than three Testimonials, to be sent to the undersigned on or before the 30th day of September, 1899.
Canvassing members directly or indirectly will disqualify any applicant.
By order of the Council,
W. R. HALL JORDAN,
Clerk.
Teignmouth, Devon,
Sept. 5, 1899.

WANTED, a Second-hand Scrubber, about 5 feet in diameter, and about 24 feet high, without Valves, for immediate delivery.
Send Particulars to KITSON, Manager, DEREHAM.

PATENT for Sale in valuable Automatic GAS GOVERNOR or REGULATOR for Gas-Works, which will govern any Changes of Pressure from Day to Night, &c., that it may be set to. Patented by parties who have had long experience in Gas Pressures and Distribution.
Address SAMUEL FARMER, 29, Third Street, ELIZABETH, N.J., U.S.A.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

TO BE SOLD cheap, to clear—
Several Sets of modern RETORT IRONWORK.
Four Wrought-Iron ANNULAR CONDENSERS.
EXHAUSTER and ENGINE combined (Waller), Valves, Governors, &c., to pass 30,000 feet.
PURIFIERS, Four 6-feet, four 10-feet squares, Valves, &c.
GASHOLDER TANK, Cast, 31 ft. by 12 ft., four years old. New Gasholder to suit.
Several other Sizes and Apparatus.
J. FIRTH BLAKELEY AND CO., Thornhill, DEWSBURY.

IRON ROOF for Sale, 132 feet long by 53 ft. 4 in. Span, in first-class condition.
Apply to CLAYTON, SON, AND CO., LIMITED, Hunslet, LEEDS.

FOR SALE—Horizontal Engine and EXHAUSTER £35, STATION METER £15, TAR and WATER TANKS, Cast-Iron loose PLATES (bolted), Two BOILERS, £5 per Ton on Rail.
Full Particulars HARGREAVES AND SMITH, Metal Brokers, WOLVERHAMPTON.

ROTHERHAM CORPORATION GAS-WORKS.

FOR SALE—About 150 second-hand Two-Light WET METERS; also the CAST-IRON CASE only of a 20,000 cubic feet per hour STATION METER. What offers?
FRANK A. WINSTANLEY,
Engineer and Manager.

FOR SALE, cheap to clear out—
One upright GAS-COMPRESSING PUMP, with two Double-Acting Cylinders, suitable for Hand or Power.
One 7 ft. by 2 ft. Railway Carriage GAS CYLINDER (German make), with Reducing-Valves, Pressure-Gauge, Regulator, Two Lamps, &c., complete.
Address No. 3337, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS-WORKS FOR SALE.

THERE will be exposed for Sale by Public Roup (unless previously disposed of by private bargain), within the Commercial Hotel, Kincardine-on-Forth, on Saturday, the 16th inst., at Twelve o'clock noon, the GAS-WORKS and PLANT at KINCARDINE, as a going concern, with Manager's House, &c.
Offers to be lodged with the Subscribers, in whose hands are the Articles of Roup.
CLARK AND ROSS,
Solicitors.
Kincardine, Sept. 1, 1899.

GAS PLANT FOR SALE.

THE Directors of the Renton Gaslight Company offer the following Plant FOR SALE:—
One CAST-IRON TANK and GASHOLDER (capacity 20,000 cubic feet).
One GASHOLDER (capacity 8000 cubic feet).
One 8-inch and One 6-inch STATION GOVERNOR, with all Valves and Connections.
The above are being removed to make room for Extensions, and are all in good condition.
Any further Information will be supplied by the undersigned, with whom Offers can be lodged on or before the 30th inst., endorsed "Offer for Gas Plant."
WM. WHYTE,
Manager.
Gas-Works, Renton,
Sept. 8, 1899.

SHANGHAI GAS COMPANY.

ASSISTANT ENGINEER.

THE Directors of the Shanghai Gas- Company invite applications for the post of ASSISTANT ENGINEER.
Candidates must be between 24 and 32 years of age, fair Draughtsmen, practically acquainted with the most recent practice in Gas-Works Engineering and Management, including the manufacture of Carburetted Water Gas, and able to instruct the native Workmen in all details of Gas-Works Construction.
The engagement will be for a period of five years. First-class Passage out and home will be defrayed by the Company. Commencing Salary equivalent to £300 per annum, and Allowances.
List of duties can be obtained from the undersigned, to whom all applications must be delivered (accompanied by not more than three recent Testimonials) on or before Saturday, the 16th of September, 1899.
H. KING-HILLER,
Engineer.
Care of Thompson M'Liotock, Esq., C.A.,
88, St. Vincent Street,
Glasgow.

DRIFFIELD URBAN DISTRICT COUNCIL.

CAST-IRON PIPES AND SCRUBBER.

THE above Council invite Tenders for the supply of 249 yards 8-inch CAST-IRON MAIN and 444 yards of 7-inch CAST-IRON MAIN, and about Two Tons of SPECIAL CASTINGS.
They are also prepared to receive TENDERS for the supply of a GAS-SCRUBBER, about 40 feet high by 7 feet diameter.
Particulars of the above may be obtained on application to the undersigned.
The Council do not bind themselves to accept the lowest or any Tender.
HENRY TOBEY.
Malton, Yorks.

COUNTY BOROUGH OF BURY.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the removal of their surplus COKE. Estimated quantity, about 3000 Tons. To be removed between the 1st of October, 1899, and the 31st of March, 1900.
Form of Tender and Conditions forwarded on application to Mr. H. Simmonds, Engineer and Manager, Gas-Works, Bury.
The Gas Committee do not bind themselves to accept the highest or any Tender, or consider any Tender for a quantity of less than 50 Tons; and further reserve to themselves the right to allot the quantity offered in such quantities as they may think fit.
Sealed Tenders, endorsed "Coke," to be delivered to the undersigned on or before Saturday, the 23rd of September, at Nine a.m.
JOHN HASLAM,
Town Clerk.
Corporation Offices, Bank Street,
Bury, Sept. 8, 1899.

RHONDDA URBAN DISTRICT COUNCIL.

(Gas and Water Department.)

TENDERS FOR STORES.

THIS Council are prepared to receive TENDERS for the supply of SULPHURIC ACID, LEAD PIPE, IRONMONGERY, TIN, &c., WROUGHT-IRON TUBING, OILS and TALLOW, GAS, WATER, and GUN METAL FITTINGS, as may be required for the Half Year ending the 31st of March, 1900.

Specifications and Forms of Tender may be obtained on application to the Engineer, Mr. Octavius Thomas, Gas and Water Offices, Pentre, R.S.O., Glam., upon depositing the sum of £1 1s. for each, which will be returned on receipt of *bonâ-fide* Tenders, but to be forfeited in the case of withdrawal of Tender after acceptance by the Council.

Tenders, endorsed "Contract No. 1, 2, &c.," as the case may be, addressed to the Chairman of the Gas and Water Committee, to be sent to the undersigned on or before Thursday, the 21st inst.

The Council do not bind themselves to accept the lowest or any Tender.

Walter H. Morgan,
Clerk.

Council Offices, Pentre, R.S.O., Glam.,
Sept. 5, 1899.

OTTOMAN GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Shareholders of this Company will be held at 9, Queen Street Place, Cannon Street, E.C., on Tuesday, Sept. 19, 1899, at Half-past One o'clock precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 30th of June last, to declare a Dividend, and for General Purposes.

The TRANSFER BOOKS WILL BE CLOSED from Sept. 21 to 28, both days inclusive.

By order of the Board,
Thomas Guyatt,
Secretary.

9, Queen Street Place, Cannon Street,
London, E.C., Sept. 5, 1899.

EAST LONDON WATER-WORKS COMPANY.

NOTICE is Hereby Given, that the HALF-YEARLY ASSEMBLY of Proprietors will be held at the Company's Offices, St. Helen's Place, Bishopsgate Street, E.C., on Thursday, the 5th of October, 1899, at Twelve o'clock noon precisely, pursuant to Act of Parliament.

The TRANSFER BOOKS in respect of the ORDINARY STOCK WILL BE CLOSED from the 21st of September inst. to the 11th of October inclusive, and RE-OPENED on the 12th of October, on which day the Dividends on this Stock will be payable.

By order,
I. A. Crookenden,
Secretary.

St. Helen's Place,
Bishopsgate, E.C., Sept. 7, 1899.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 27th inst., at Half-past Twelve o'clock precisely, to transact the usual Business, to declare a Dividend for the Half Year ended the 30th of June last, and to elect Two Directors and One Auditor in place of those who go out by rotation, but who are eligible to be re-elected.

Notice is Hereby also Given, that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 16th inst., and RE-OPENED on the 28th inst.

By order of the Court of Directors,
H. B. Chamberlain,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.,
Sept. 6, 1899.

SCARBOROUGH GAS COMPANY.

SALE BY TENDER OF MORTGAGES.

Pursuant to Section 21 of the Scarborough Gas Act, 1895.

NOTICE is Hereby Given, that the Directors of the Scarborough Gas Company intend to SELL by TENDER MORTGAGES to the amount of £5000, for the general purposes of the Undertaking.

The Mortgages will be granted under, and by virtue of, the Scarborough Gas Act, 1895. They will be issued for amounts of £100 each, and will bear Interest at the rate of 3½ per cent. per annum, payable half yearly; and the principal moneys secured thereby will be repayable on the 31st day of December, 1919.

The existing paid-up Share Capital of the Company is £179,900; and the Loan Capital consists of Mortgages to the amount of £42,750, bearing Interest at the rate of 3½ per cent. per annum.

The Mortgages to be now issued will rank before the whole of the Company's existing and authorized Share Capital; and the Interest thereon will have priority of payment over all Dividends on such Share Capital, and will rank equally with the Interest on all Mortgages and Debenture Stock of the Company.

Tenders must be sent in to the Company's Offices, 32, Westborough, Scarborough, not later than Twelve o'clock noon on Monday, the 2nd day of October, 1899; but no Tender will be accepted at a lower price than £100 for each Mortgage, and every purchaser must pay the whole of his purchase-money on or before Tuesday, the 31st day of October, 1899.

Copies of the Company's Special Acts may be seen at the Company's Offices, where Particulars and Forms of Tender may be obtained on application.

By order of the Directors,
J. Holliday,
Secretary.

The Scarborough Gas Company's Offices,
32, Westborough, Scarborough, Sept. 1, 1899.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held MONTHLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by Auction of Gas and Water Stocks and Shares under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. Alfred Richards's Offices, 18, Finsbury Circus, E.C.

By order of the Directors of the
PLYMOUTH AND STONEHOUSE GASLIGHT AND COKE COMPANY.

NEW ISSUE OF CAPITAL.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on

TUESDAY, the 10th of OCTOBER, 1899,
at Two o'clock precisely, in Lots,

£5000 OF ORDINARY STOCK
OF THE
PLYMOUTH AND STONEHOUSE GASLIGHT AND COKE COMPANY,

ranking for a Standard Dividend of 5 per cent., subject to the Sliding-Scale; the last Dividend having been 6½ per cent.

Particulars of the Secretary of the Company, at the Offices, Plymouth; and of the Auctioneer, 18, Finsbury Circus, E.C.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

MR. ALFRED RICHARDS will include in the above Sale

£950 "A" STOCK, and
£600 "B" STOCK

in the above Undertaking, and upon which the last Dividends paid were 6 and 4½ per cent. respectively.

Particulars of the Auctioneer as above.

Re Mrs. Louisa Baynes, deceased.

REIGATE GAS COMPANY, SUTTON GAS COMPANY, AND NEWHAVEN GAS COMPANY.

MR. ALFRED RICHARDS will include in the above Sale

REIGATE GAS COMPANY—£290 STOCK.

SUTTON GAS COMPANY—80 £10 SHARES and £100 FOUR PER CENT. DEBENTURE.

NEWHAVEN GAS COMPANY—134 £10 fully-paid SHARES.

Particulars of the Auctioneer as above.

FIVE THOUSAND POUNDS

FIVE PER CENT.

ORDINARY STOCK
IN THE
SOUTHAMPTON GASLIGHT AND COKE COMPANY

TO BE SOLD by Auction by PERKINS AND SONS
IN LOTS OF £100,
on Friday, September 15, 1899,
at the
Gas Company's Offices, Ogle Road,
SOUTHAMPTON,
At Half-Past Two for Three o'clock precisely.

Further Particulars may be obtained of the Secretary, Ogle Road, Southampton; or of Perkins and Sons, Auctioneers and Valuers, Southampton.

THE BRISTOL GAS COMPANY.

IMPORTANT ISSUE OF
GENERAL CAPITAL STOCK
AND
NEW DEBENTURE STOCK.

GEO. NICHOLS, SMITH, & ALDER are instructed to SELL by PUBLIC AUCTION, at their Sale-Rooms, 49, Broad Street, Bristol, on Thursday, the 14th day of September, 1899, at Three p.m. precisely,

IN LOTS OF £100 EACH,

£16,000
FIVE PER CENT. MAXIMUM
GENERAL CAPITAL STOCK
AND
£4000
NEW DEBENTURE STOCK

(Bearing *INTEREST AT THE RATE OF FOUR POUNDS PER CENT. PER ANNUM*, payable half-yearly in June and December),

OF AND IN
THE BRISTOL GAS COMPANY,

Issued by the Company under their Statutory Powers.

The Stock will be Sold and Registered in the Books of the Company *free of every expense* to Purchasers thereof.

Full Particulars and Conditions of Sale may be obtained of the Auctioneers, 49, Broad Street, Bristol; Messrs. Brittan, Livett, and Miller, Solicitors, Albion Chambers, Bristol; or of

John Phillips,
Secretary.

Chief Office, Canons' Marsh, Bristol.

NOTICE.

COIN-FREED GAS-METERS.

METERS LIMITED, Registered Owners of the Letters Patent 2662 of 1898 granted to Joseph Nasmith and Arthur Mercer for an Invention for "IMPROVEMENTS IN AND RELATING TO COIN-FREED GAS-METERS," which Invention is in respect of a detachable Prepayment Attachment, HEREBY WARN MAKERS, SELLERS, and USERS from making or using any detachable Prepayment Attachment in Infringement of their Legal Rights.

Proceedings will be instituted against any or all persons so infringing.

Dated this 30th day of August, 1899.

E. Robinson Walker & Son,
Solicitors, 18, St. Ann Street, Manchester.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD
BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

BOLDON GAS COALS.

ANALYSIS.

Yield of Gas per Ton. .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

For Prices, &c., apply to
W. H. PARKINSON,
THE HARTON COAL CO., LTD.,
NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON, NEWCASTLE."

THE SILICA FIRE-BRICK COMPANY,
OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY,
Strongly recommended where EXCESSIVE HEATS have to be maintained.

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
London Office:
90, CANNON STREET, E.C.

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 34, OLD BROAD STREET, E.C.

JAMES OAKES & CO.

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL Co., Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

Messrs. J. & H. S. PATTINSON.

Yield of Gas per Ton . .	10,500 Cub. Ft.
Illuminating Power . . .	16·9 Candles.
Coke (of good quality) . .	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

HOLMSIDE

GAS COALS.

Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . .	11,205 Cubic Feet.
Illuminating Power	16$\frac{7}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality)	13¾ Cwt. per Ton.
Sulphur	A little over 1 per Cent.
Ash	Under 1 per Cent.
Tar	163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor	103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR

PELTON GAS COALS.

Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE & SOUTH MOOR OFFICES,

NEWCASTLE-UPON-TYNE.

NITRATE of Thorium and Cerium.
FABRIK CHEMISCHER PRAEPARATE VON STHAMER, NOACK, AND CO., HAMBURG.

ENRICH YOUR GAS

WITH CHEAP

BENZOL

SPECIALLY PREPARED, FREE FROM SULPHUR.

AT to-day's Price of Benzol, Illuminating POWER costs less than ONE-THIRD OF A PENNY PER CANDLE.

Apply to SADLER & CO., MIDDLESBROUGH.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available Output up to 5000 Tons per day.
Yield of Gas 11,000 cubic feet per Ton of Coal as per Analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,

SEAHAM HARBOUR, COUNTY OF DURHAM.

THE

"FARRINGDON" LANTERN

FITTED WITH STEEL ENAMELLED WHITE REFLECTOR.

This Favourite Lamp has been largely adopted by many Corporations and Lighting Authorities.

Fitted with the Patent Talbot Bye-Pass Tap and Clay's Anti-Vibratory Coil and No. 4 New Welsbach Burner.

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19, Farringdon Rd., London, E.C.

Telephone: 1915 HOLBORN.

Telegrams: "LUMINOSITY, LONDON."

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER." Telephone 1806.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH N.B.

WELDON MUD

FOR

GAS PURIFICATION.

For use in the

RECOVERY OF SULPHUR,

ALSO

Removal of last Traces of SULPHURETTED HYDROGEN in catch position.

Full Particulars on application to the Patentees:

GAS DESULPHURIZATION CO.,

— LIMITED, —

1, FENCHURCH AVENUE, LONDON, E.C.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,

COAL OWNERS, NEWCASTLE-ON-TYNE;

OR

E. FOSTER & CO.,

21, JOHN STREET, ADELPHI, LONDON, W.C.

JOHN BROWN & CO., LTD., SHEFFIELD,

Proprietors of

ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·80.

VERY FREE FROM IMPURITIES.

TELEGRAMS: "ATLAS, SHEFFIELD."

JAMES MILNE & SON,

LIMITED,

Milton House Works EDINBURGH.

LONDON. GLASGOW. LEEDS.

STATION METERS

RECENTLY ERECTED AND IN HAND.

PAISLEY	150,000	cub. ft.	per hour.
EDINBURGH	125,000	,,	,,
LEEDS	100,000	,,	,,
MIDDLESBROUGH	100,000	,,	,,
WEST HARTLEPOOL	100,000	,,	,,
HAMILTON	80,000	,,	,,
KIRKCALDY	80,000	,,	,,
PERTH	80,000	,,	,,
WOOLWICH	50,000	,,	,,
HAWICK	40,000	,,	,,
REDCAR	30,000	,,	,,
INVERNESS	25,000	,,	,,
HINCKLEY	20,000	,,	,,
WORKINGTON	20,000	,,	,,
ECCLESHILL	15,000	,,	,,

H. KIRKHAM'S PATENT "IMPERIAL" WASHER-SCRUBBER.

TESTIMONIAL

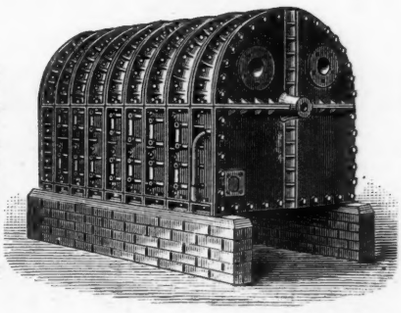
The Dover Gaslight Company,
Gas-Works, Buckland,
Dover, Feb. 8, 1899.

H. KIRKHAM, Esq.

Dear Sir,—Have now made further tests with the Washer fitted with your PATENT WASHING DEVICES, and have much pleasure in reporting that *the results were highly satisfactory*; also, I ascertained that the maximum results were obtained when the machine was working at three revolutions per minute. At this speed 13 to 14 gallons of water per ton of coal carbonized were converted into 10-oz. Ammoniacal Liquor, and at same time the Gas was free from Ammonia.

Should you wish further details, I will forward them.

I am, dear Sir, yours truly,
RAPHAEL HERRING, Engineer.



EFFICIENCY GUARANTEED.

Estimates given for a complete set of Segments for one wheel, or for refitting the whole number of wheels in a machine, also for Washer-Scrubbers complete.

The Scrubbing Devices are metal scrolls fixed in cages of segmental form, which can be readily and successively removed from the wheels through a manhole on the top or side of the machine, and the enclosed Scrubbing Devices taken out, cleaned, and replaced without the delay that necessarily takes place when the entire scrubbing material of the whole wheel has to be dealt with in one operation—thus effecting an important saving in time and labour. These Cages can be applied to the wheels of any machines of the type shown, and will increase their efficiency above 20 per cent.

The Scrubbing Devices are unequalled for extracting the whole of the Ammonia and a very large proportion of the Carbonic Acid and Sulphuretted Hydrogen from the Gas; and, if required, the strength of the Ammoniacal Liquor can be worked up to 30 oz. and above, which greatly reduces the quantity of Oxide or Lime, and also the amount of Labour for Purification.

OFFICE: 25, Victoria Street, Westminster, LONDON, S.W.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

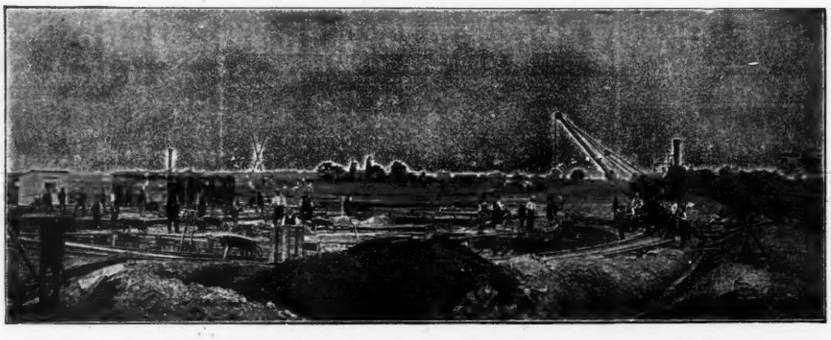
Midland and West of England District Office: 6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.
Telegraphic Address: "WIGAN, BIRMINGHAM." Telephone No. 200.

London District Office: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.
Telegraphic Address: "PARKER, LONDON."

GASHOLDER TANK, EMBANKMENT, & RAILWAY

Telegrams: "Robustness, London." **UNDER CONSTRUCTION BY OUR OWN WORKMEN.** Telephone No. 756 Bank.

RESERVOIRS, TRIAL BOREHOLES and WELLS. MAIN and SERVICE LAYING.



COMPLETE GAS and WATER WORKS ERECTED and SET to WORK including ALL MAINS.

J. & H. ROBUS, Engineering Contractors,
20, BUCKLERSBURY, LONDON, E.C.
For Carbonizing Advt., see last Issue.

OIL FOR GAS MAKING

PURE DISTILLATE.

HOMOGENEOUS IN CHARACTER.

NO MIXTURE.

CAN BE STORED SAFELY ANYWHERE.

FLASH POINT GUARANTEED OVER 200° FAHR.

(ABEL'S CLOSED TEST.)

ANGLO-CAUCASIAN OIL COMPANY, LTD.

8, 9, 10, & 11, LIME STREET, LONDON, E.C. | INDIA BUILDINGS, CROSS ST., MANCHESTER.

BRAY'S

"SPECIAL" GAS-BURNERS.

SUITABLE FOR ALL PRESSURES AND CONDITIONS.

GEO. BRAY & CO.

GAS LIGHTING ENGINEERS,

BAGBY WORKS, LEEDS.

Telephone No. 103. Telegraphic Address: "ELEVATOR, HASLINGDEN."

S. S. STOTT & CO.,

ENGINEERS, HASLINGDEN, NR. MANCHESTER.

COAL AND COKE ELEVATORS & CONVEYORS.

COAL AND COKE STORAGE PLANTS.

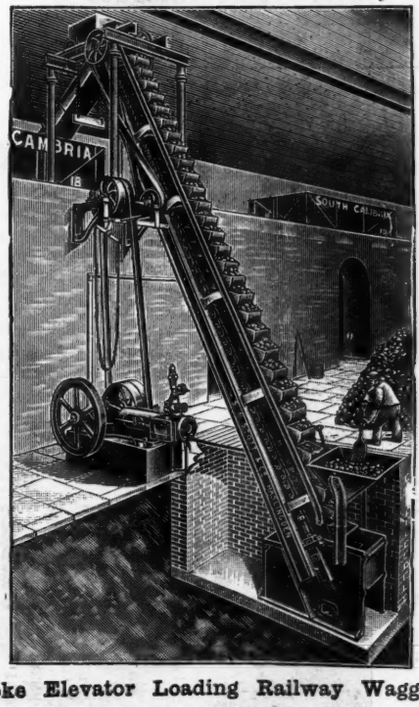
COAL AND COKE BREAKERS.

WHARF ELEVATORS FOR UNLOADING BARGES.

ELEVATORS & CONVEYORS for BOILER-HOUSES.

STAMPED AND RIVETED STEEL ELEVATOR BUCKETS.

DETACHABLE CHAINS AND SPROCKET WHEELS.



Coke Elevator Loading Railway Waggons.

LIME AND OXIDE ELEVATORS & CONVEYORS.

HIGH-CLASS STEAM-ENGINES up to 1000-Horse Power.

PUMPS, HORIZONTAL AND VERTICAL, SINGLE, DOUBLE, or THREE-THROW, for WATER-WORKS, &c.

BEAM PUMPING-ENGINES.

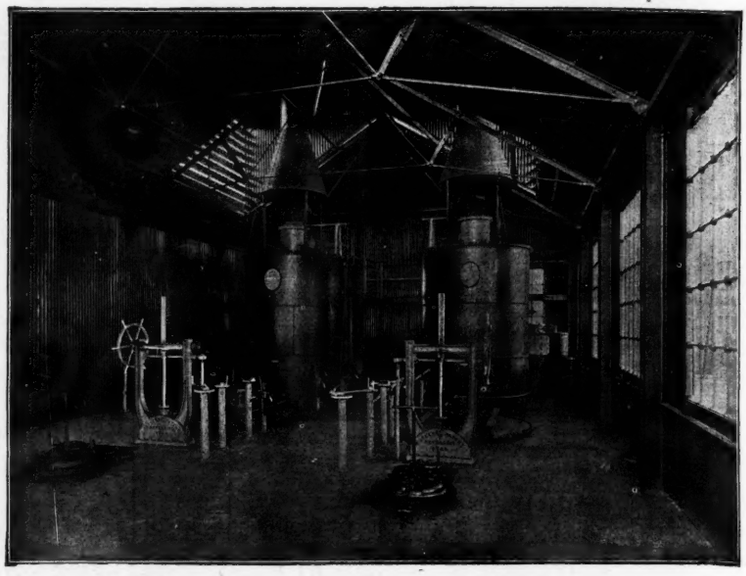
AIR-COMPRESSORS.

BELT PULLEYS, ROPE PULLEYS, GEARING, &c., &c.

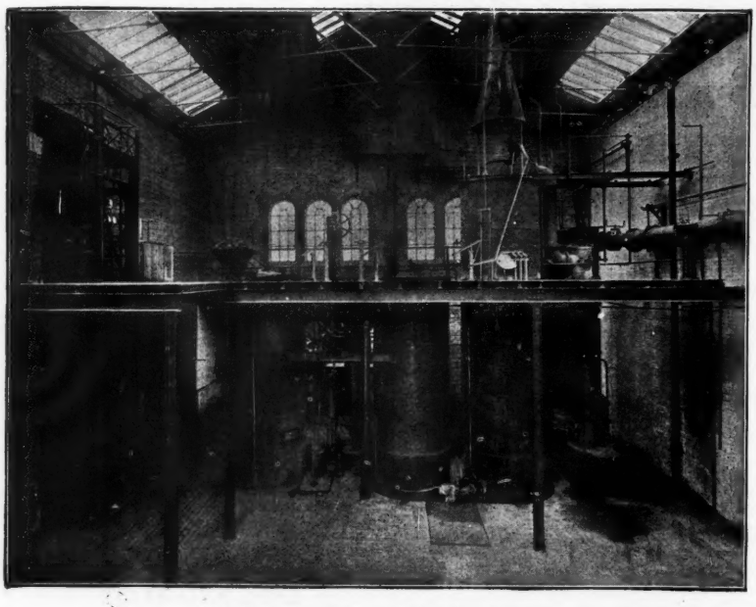
S. Cutler & Sons,
Millwall, London.

GASHOLDERS.

CARBURETTED WATER-GAS PLANT.



Water-Gas Plant at Southall.



Water-Gas Plant at Folkestone.

Carburetted Water-Gas Installations.

HORNSEY.
HASTINGS.
BUENOS AYRES.
SOUTHEND.
PLYMOUTH.
SOUTHALL.
HARROW.
HORSHAM.
FOLKESTONE.
BEXHILL.

SOUTHEND (2nd Order).
PLYMOUTH (2nd Order).
SOUTHALL (2nd Order).
FOLKESTONE (2nd Order).

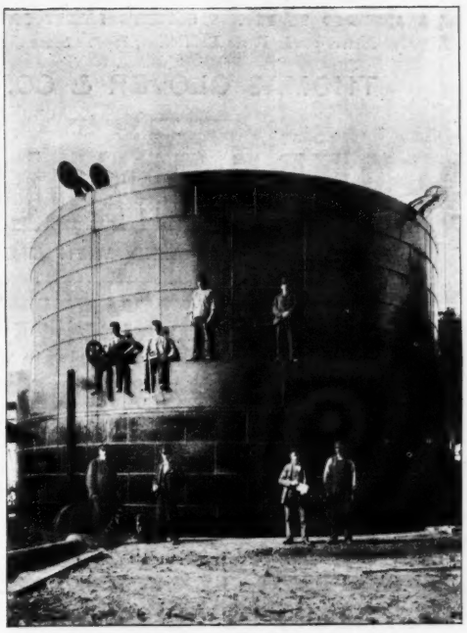
CUTLER'S PATENT GUIDE-FRAMING FOR GASHOLDERS

ADOPTED FOR
MANY IMPORTANT
GASHOLDERS.

OIL-TANKS.

EVERY DESCRIPTION OF
GAS-WORKS APPARATUS.

Water-Gas Plant at Southend.



Inner Lift added to a Single Holder, Columns removed, and Cable System substituted.

The **COLUMNS** or Standards **OF GASHOLDERS,** as every Gas Engineer knows, are a very large item in the cost of Storage. This expenditure is **QUITE USELESS** and unnecessary now that the guiding of a Gasholder can be done so safely and satisfactorily by means of **STEEL CABLES.** Six well-known Gas Companies have actually taken down the old-fashioned method of Guiding, and have **SUBSTITUTED** the Cable System. They are now able to work their Holders, which previously gave endless trouble. This fact should prove to others who desire to be up to date that **STANDARDS,** although they have served their purpose for a great number of years, are by no means a necessity, but rather a wasteful extravagance, and in more than 60 Gasholders have been **SUPERSEDED.**

ASHMORE, BENSON, PEASE, & CO., LTD.

STOCKTON-ON-TEES,

MANUFACTURERS OF

GASHOLDERS, PURIFIERS, SCRUBBERS, CONDENSERS, WASHERS, ROOFS, GIRDERS, SULPHATE PLANTS, VALVES, &c., &c.

London Office: 181, QUEEN VICTORIA STREET, E.C.

Telegrams: "Gasholder, Stockton-on-Tees." "Apparatus, London."

Paris Office: 3, SQ. DES BATIGNOLLES.

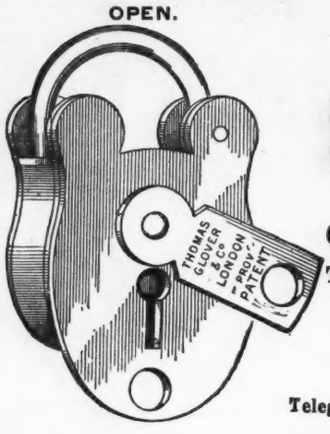
ESTABLISHED 1844. **ORIGINAL MAKERS.** ESTABLISHED 1844.

LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;

The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.

OPEN.



THOMAS GLOVER & CO.'S

PATENT

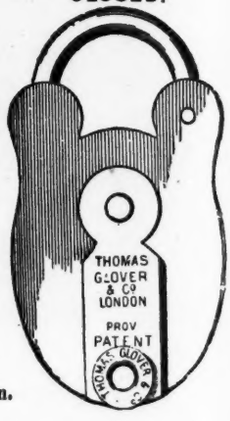
SECURE PADLOCK

PREVENTS TAMPERING WITH THE

CASH-BOXES OF PREPAYMENT METERS.

The Padlock is Sealed by means of a Lead Eyelet, which is impressed with Company's private mark. Eyelets easily fixed and removed by Company's Collector.

CLOSED.



Telegraphic Address: "GOTHIC, LONDON." Telephone No. 725, Holborn.

THOMAS GLOVER & CO., LTD.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN, LONDON, E.C.

BRISTOL: 28, BATH STREET. *Telegraphic Address: "GOTHIC."* Telephone No. 1025.

BIRMINGHAM: 1, OOZELLS STREET. *Telegraphic Address: "GOTHIC."*

MANCHESTER: 37, BLACKFRIARS STREET. *Telegraphic Address: "GOTHIC."* Telephone No. 3198.

GLASGOW: ARGYLE WORKS, KINNING PARK. *Telegraphic Address: "GASMAIN."* Telephone No. 1525 South Side.

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MANUFACTURERS OF

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EXHAUSTERS,

VALVES,

AND

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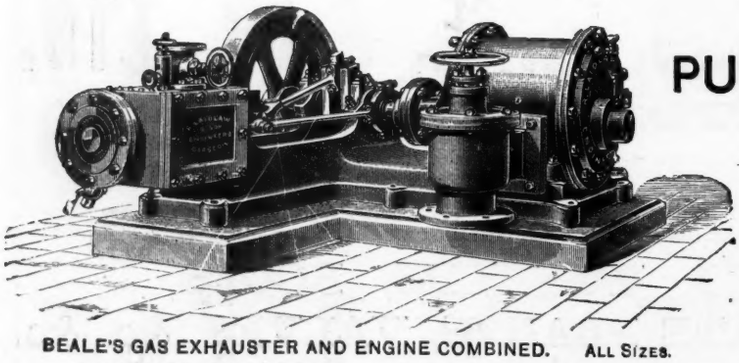

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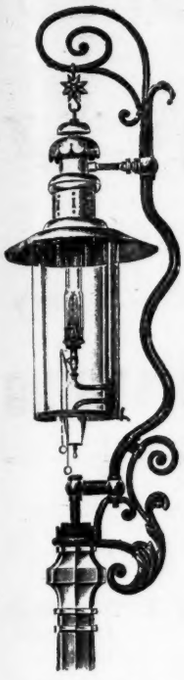

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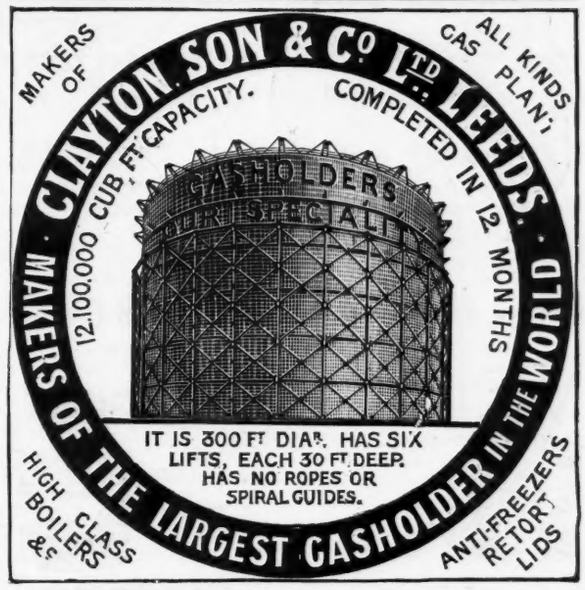
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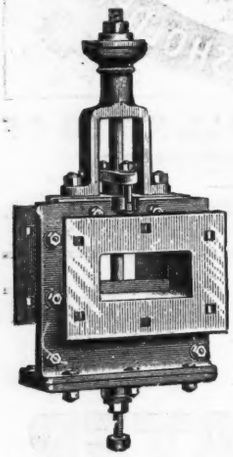

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